

GENERAL SPECIFICATIONS FOR MACHINERY FOR VESSELS OF THE UNITED STATES NAVY

NAVY DEPARTMENT, BUREAU OF SHIPS

1 October 1945

SECTION S1-1 PLANS

Superseding Section S1-1, dated 1 March 1941

- 5 For materials, workmanship, and installations, see section S1-2.
For Instruction Books and Record of Electrical Appliances (formerly in this section), see section S1-5.
For designation and marking, see sections S28-1 and S28-2.

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S1-1-a. Purchase specifications

- 30 Issued at date of invitation for bids shall govern.
Copies of Navy Department (N. D.) Specifications, Bureau of Ships Ad Interim (INT) Specifications, and Federal (Fed.) Specifications where referred to herein may be obtained upon application to the Bureau of Supplies and Accounts, Navy Department, Washington 25, D. C., except that Naval activities should make application to the Supply Officer-in-Command, Naval Supply Depot, Bayonne, N. J.

S1-1-b. Security of plans

- 40 Plans for the machinery, electrical equipment, electronic equipment, and accessories of vessels building for the Navy are of a classified nature and shall be designated in accordance with existing security regulations of the United States Navy. It shall be observed that they do not fall into the category of unauthorized persons, especially not citizens of the United States.

45 For ready reference purposes, excerpt from the Espionage Act of June 15, 1917 (50 U. S. C. 31-32) is quoted below:

"* * * whoever, lawfully or unlawfully, having possession of, access to, control over, or being

intrusted with any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note relating to the national defense, willfully communicates or transmits or attempts to communicate or transmit the same to any person not entitled to receive it, or willfully retains the same and fails to deliver it on demand to the officer or employee of the United States entitled to receive it; or whoever, being intrusted with or having lawful possession or control of any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, note, or information, relating to the national defense, through gross negligence permits the same to be removed from its place of custody, delivered to anyone in violation of his trust, or lost, stolen, abstracted, or destroyed, shall be punishable by a fine of not more than \$10,000, or by imprisonment for not more than 2 years, or both.

S1-1-c. Definition of classes of plans

The following terms are used in this specification to define the types of plans for machinery and equipment to be supplied to the Bureau:

- Preliminary plans (formerly type A)—Plans to be submitted with bids, or other plans submitted prior to contract. 75
- Working plans (formerly type B)—Plans to be submitted for approval subsequent to award of contract but prior to ordering material or commencing work. 80
- Corrected plans (formerly type D)—Plans submitted after work is completed with corrections to show the vessel or a part of the vessel or its machinery systems, etc., as actually constructed. 85
- Master plans—Plans having a broad application in the sense that they are, or will become applicable to more than one type of vessel, or classes of vessels of the same type. 90

S1-1-d. Preliminary plans (formerly type A)

Preliminary plans submitted in connection with bids for the building of vessels shall consist of such sketches and plans as may be necessary to amplify the Bureau's original contract plans. Such plans shall be submitted in duplicate with bids or as required by the invitation for bids. 95

When equipment for vessels is to be purchased directly by the Bureau in accordance with these specifications, preliminary plans in duplicate shall be furnished with the bids, or as may be specifically called for in the requisition, contract or order. In any case one set shall be for the files of the Bureau of Ships and the remainder filed as 100

directed by the Bureau of Supplies and Accounts except for material purchased on Bureau of Ships contracts, in which event, all plans shall be forwarded to the Bureau of Ships.

- 5 Preliminary plans shall consist of all sketches, cuts, plans, or other descriptive material as may be necessary to show completely the character and design of the material or equipment it is proposed to furnish, and in amplification of the description and guarantees described in the wording of the bid.

- 10 For equipment such as turbines, pumps, motors, generators, condensers, boilers and similar units, sectional plans shall be furnished which show clearly the details of the design, the materials of which the units are to be built, the over-all dimensions, and the space required for operation and overhaul.

- 15 For equipment such as distilling plants, refrigerating plants, and similar installations an arrangement plan shall be furnished showing the space occupied by the equipment, the space required for operation and overhaul, and units which make up the plant. Sectional plans of the principal units containing the information required in the preceding paragraph, and such other information as will permit a clear understanding of the plants and their operation shall be also furnished.

- 20 Award of contract in connection with preliminary plans has been submitted does not require approval of such preliminary plans as construction or manufacturing plans. They are subject to modification in the development of working plans as demanded by the requirements of the specifications and terms of the contract.

SI-1-e. Working plans (formerly type B)

- Working plans shall consist of (1) Preliminary diagrammatic; and/or (2) Detail working plans of all machinery and equipment prepared in the development of the contract specifications and shall be submitted for approval via the Bureau's inspector or Supervisor of Shipbuilding with suitable letter of transmittal for each vessel covered, as soon after award of contract as possible and before work covered by such plans is commenced. Separate lists of gaskets and packing, thermometers, gages, reducing valves, regulating valves, and relief valves shall also be provided. General arrangement or assembly plans of main and auxiliary machinery and diagrammatic plans of piping, lighting, power, and interior communication shall be approved before detail working plans are submitted. Any deviation from design or noncompliance with specifications shall be covered in the plan submission letter with plans for approval.

- 50 In the case of new designs for auxiliaries, the working plans shall include a calculation plan with computations in sufficient detail to indicate the adequacy of the proposed design, unless specifically waived. Such computations shall show assumed efficiencies, allowable stresses, factors of safety, design and working pressures, power requirements for driven equipment, torque capacity of installed electrical and mechanical brakes, capacity requirements for hydraulic equipment, and related design data, as applicable.

- 60 **Weights.**—As the working plans are developed, the shipbuilder shall enter the calculated weights on the plans in accordance with the following general requirements:

- 65 (a) Assembly plans of units and equipment shall have indicated thereon the calculated or actual weight (indicate which) of the assembled unit or piece of equipment.

Assembled units of 1,000 pounds or over shall have the center of gravity indicated. The detail plans of parts forming the assembly shall have notes thereon referring to the assembly plans on which the weights are recorded. 70

(b) Piping arrangement plans shall have indicated thereon the calculated weights of the systems. Where applicable, weights of piping systems shall be indicated by subject subdivisions in accordance with the latest edition of Instructions to Supervisors of Shipbuilding for Recording and Reporting Weights of Finished Machinery. 75

(c) Electrical weights for interior communication, fire control, electronic equipment and mine protective systems shall be indicated by circuits and totals for each system. Power and lighting systems need not have weights indicated on the deck plans or feeder lists, but the plans of these systems shall be cross-referenced to a plan covering a summary of the calculated weights for each of these systems. See also paragraph SI-1-1. 80

(d) The submission of plans for approval shall not be withheld awaiting entry of calculated or actual weights; but these weights shall be determined and entered on the plans as required in the foregoing paragraphs as early as practicable. 85

Approval. Working plans for approval shall be blueprints furnished in triplicate, unless otherwise specified, where the equipment covered thereby is entirely under the cognizance of the Bureau of Ships. If other Bureaus are involved one additional copy shall be furnished for each of the other Bureaus concerned. Of the copies furnished, one shall be retained by the Bureau's representative and the remainder shall be forwarded by him to the Bureau. If required as the result of the Bureau's action the shipbuilder or contractor shall modify the plans as required. The shipbuilder or contractor shall present the modified tracings to the Bureau's representative for validation. The Bureau's representative shall be supplied with three blueprints of each approved plan; one blueprint shall be retained by the Bureau's representative and the remainder forwarded to the Bureau. The shipbuilder or contractor shall furnish such additional blueprints or vandykes of plans as may be required. These may include reproductions of Government-furnished equipment when reproducible copies of such plans are available in the files of the shipbuilder or contractor or the Bureau's representative. 90 95 100 105 110

Where two or more vessels of the same class are under construction at the works of the same shipbuilder, or where plans are developed by a central drafting room or design agent, working plans pertaining to equipment common to two or more vessels shall be submitted as for one vessel and the number of blueprints furnished shall be as directed by the Bureau, the cognizant Supervisor of Shipbuilding or the cognizant Inspector. In such case plans shall show the class designation of all vessels covered and letter of transmittal shall give the same information together with contract number of each vessel. 115 120

Any alteration made on an approved plan during progress of work shall require approval in the same manner as the original. Copies of altered or altered plan, if approval is obtained, shall be supplied in the same number and manner as the original. Plan shall carry a table of alterations serially numbered giving date, nature of each alteration, and reference authority for change; such alteration tables shall indicate the character of the original design features which have been altered. The Bureau's representative shall certify approved alterations. 125 130

tions as in the case of the original plan. See paragraph S1-1-q.

In the purchase of equipment directly by the Navy Department, working plans shall be furnished for the action of the Bureau's representative or the Bureau prior to fabrication of any material, unless the contract specifically states otherwise. In such case the method of preparing plans, etc., shall be identical with that specified herein, except for variations in the procedure to be followed covering approval of plans and the number and kind of copies of plans required to be furnished by the contractor as specified in the requisition, contract, or order.

Working plans will not be required for machine tools except for certain specially designed tools, in which case the exact plan requirements will be specified in the contract or order.

S1-1-f. Corrected plans (formerly type D)

Corrected plans shall consist of pen and ink or photographically reproduced cloth tracings of the original working plans corrected to show the work as actually accomplished. They shall be clear, clean, sharp, and free of wrinkles or creases. The Bureau plan numbers assigned to these plans as working plans shall be retained when submitted as corrected plans. All such plans should be marked or stamped "Corrected Plan" in the space provided for same as shown on plan, BuShips No. S0103-655774, see copy attached. Corrected plans to be micro-filmed shall comply with the requirements specified in paragraph S1-1-o.

Corrected plans shall be furnished for all finished work, and shall be sufficiently extensive in detail to enable parts of the machinery and electrical installation of a vessel to be duplicated without additional plans, and shall contain sufficient information to permit any part to be readily identified in orders for replacement; for the latter purpose only, photographs mounted on cloth back sheets with part numbers clearly marked thereon will be acceptable to amplify and simplify, but not to replace the regular assembly plans. In general, corrected plans shall include copies of all approved working plans, unless otherwise specified.

Where photographic tracings are supplied, reproductions made from the shipbuilder or contractor's shop tracings, will, in general, be acceptable. However, whether photographic tracings are made from shop plans or otherwise, no corrected plans supplied under these specifications shall show any plan or supply any information that is not strictly applicable to the apparatus or equipment for which the plans are furnished except for certain classes of equipment which are made up of parts of subassemblies, the details of which can be indicated by the procedure specified in paragraph S1-1-h.

For equipment which is required to be in accordance with Navy Department Specifications or the General Specifications for Machinery containing specific plan requirements, the plans shall conform to the requirements specified therein, except that for corrected plans, the number of sets, size, arrangements, title and form shall conform to the requirements specified herein.

When a shipbuilder or contractor for a given class of equipment is in doubt as to the character of the corrected plans required by the Bureau, it is suggested that representative plans covering a characteristic item of equipment be submitted to the Bureau via the cognizant representative in triplicate for approval. The Bureau

will then retain one set of such plans, return one corrected set to the shipbuilder or contractor and send one corrected set to the Bureau's representative having cognizance for use in checking plans delivered on contract.

All corrected plans shall be furnished complete within 4 months after all vessels in the same design class have been delivered by the shipbuilder unless the contract specifically states otherwise.

Where plans apply to the construction of two or more vessels of the same design the corrected tracings or photographic tracings for the Bureau are required only for one vessel, whenever the apparatus covered is identical. If not identical, separate and complete sets of tracings or photographic tracings for the Bureau for all items which differ shall be furnished for each vessel so affected. If more than one vessel is covered by a plan, the official identification number and contract number for each vessel to which the plan applies shall appear thereon.

Unless otherwise specified, corrected plans shall be furnished in number and for the purpose indicated as follows:

(a) Where all vessels of a design class are built by one shipbuilder, one complete set of hand or photographic tracings for that group of vessels shall be furnished by the shipbuilder for the files of the Bureau.

(b) Where tracings are prepared or produced by a leading shipbuilder or design agent for all vessels of a design class one complete set of hand or photographic tracings shall be furnished by the leading shipbuilder or design agent for the files of the Bureau. Each tracing shall be titled to indicate all the vessels to which the plan was originally intended to apply when drawn. However, since certain of these plans may have been altered by the following shipbuilders or new plans may have been prepared or produced by following shipbuilders which may supersede the basic plan insofar as vessels built by following shipbuilders are concerned, each tracing furnished by the leading shipbuilder should be conspicuously marked or stamped "See Ship's Plan Index for verification of applicability of this plan to any vessel." The above tracings should be forwarded to the Bureau as a single shipment accompanied by a list in triplicate of all plans enclosed, giving the title and Bureau plan number of each, including the latest alteration number. A copy of the above list should be forwarded to each of the following shipbuilders.

(c) Where plans of any design class of vessels are being prepared or produced by a leading shipbuilder or design agent and being furnished to following shipbuilders for building other vessels of the class, one complete set of tracings or photographic tracings of only those plans which differ from those being furnished by the leading shipbuilder or design agent for that group of vessels shall be furnished by the following shipbuilder for the files of the Bureau. The letter forwarding the above tracings to the Bureau should state that they are the only plans applicable to the vessels concerned which differ from plans furnished by the leading shipbuilder as shown by the list referred to in paragraph (b) above.

At the time of delivery of each vessel the shipbuilder shall furnish the Commanding Officer via the Supervisor of Shipbuilding a set of blueprints in accordance with a list of working plans (corrected to show the vessel as actually completed) said list to be selected by cognizant Supervisor of Shipbuilding and approved by the Bureau. Two copies of the Ship's Plan Index shall be included with the list.

In the purchase of equipment for vessels by direct contract with the Bureau, corrected plans conforming to the requirements of the above paragraphs shall be furnished by the contractor with the delivery of the completed material in number of sets as required by the contract.

Corrected plans will not be required for machine tools except for certain specially designed tools, in which case the exact plan requirements will be specified in the contract or order.

Corrected plans shall be furnished for all interior communication and fire-control switchboards and such other equipment for which instruction books containing reproductions of working plans as finally approved are not

SI-1-g. Master plans

The Bureau of Ships Master Plan System is defined as a system under which only one complete set of approved photographic tracings of a piece of equipment is furnished to the Bureau by a contractor. This set of plans shall be used for all duplicate equipment furnished under succeeding contracts unless otherwise specified, after approval by the Bureau and assignment of Bureau master plan numbers. The Master Plan System shall be followed for all equipment produced on a quantity basis and which, because of standardized features, have a broad application such as internal combustion engines, pumps, motors, valves, and similar standardized equipment. Plans for equipment which have been approved by the Bureau as master plans require no further approval by any naval activity (except for application) provided there is no change in the master plan or the design of the equipment to which the plan applies.

The procedure for indicating the applicability of master plans to any contract under cognizance of the Bureau is accomplished by listing Bureau master plan numbers in the Ship's Plan Index (SPI), except as noted in paragraph SI-1-n. At the time the working plans are forwarded for approval, reproductions of the applicable master plans used for installation purposes (same number of blueprints as for ship's working plans) shall be included. Approval of the working plans and master plans so forwarded is equivalent to approving the application of the master plans.

In event of changes desired by the Bureau in the master plan(s) so forwarded, the Bureau will indicate the changes desired in a letter of conditional approval to the shipbuilder or contractor via the cognizant naval activity. Broad changes, if indicated by the Bureau, will remove the plan from the master plan category for the particular vessels under consideration and the shipbuilder or contractor shall then reproduce, retitle, and renumber the plan as specified for ships plans in paragraph SI-1-q.

After final approval of the application of master plans in the working plan phase, no further copies of the master plans will be required by the Bureau at the time corrected plan tracings are forwarded. However, to avoid delay and possible confusion at the time plans are placed on board the vessels, master plans shall be considered in the class with ship's plans, and the shipbuilder shall furnish the Commanding Officer via the cognizant Supervisor of Shipbuilding, copies of master plans in same number and type as for ship's plans. Any other special distribution shall be made as specified in the Special Specifications for Machinery.

After receipt by the Bureau of the approved master

plan tracing, distribution of master plan reproductions to naval activities will be made by the Bureau except as otherwise specified herein.

The shipbuilder shall specify in his contract or order with subcontractors that the material or equipment on order is desired in accordance with the Bureau of Ships Master Plan System. Sufficient reproductions of the master plan should be obtained to serve the shipbuilder's needs and provide the necessary copies to be forwarded with the working plans to the approval activity and placing on board the vessel as specified herein. Other than these requirements no master plan distribution will be required.

In the event equipment which would properly fall into the master plan category is purchased under the General Specifications, and no approval has been given by the Bureau for master plan procedure, steps shall be taken to obtain this approval.

Design consideration for master plans shall conform to the requirements specified herein for ships plans or shall be in accordance with the applicable referenced specifications, when specified.

The form in which master plans shall be submitted for approval shall be in accordance with the requirements of paragraph SI-1-e herein, with the exception that the title block shall be as shown on plan, BuShips No. S0103-655774 for master plans. Due to the wide application of these plans the title shall be as complete and descriptive as the rules of brevity permit. It is suggested that for plans to be submitted for approval the titles be entered in pencil to facilitate any changes desired by the Bureau.

In any event the title shall include the following:

Name of equipment or assembly.

Basic design data (i. e., type, model, capacity, etc.).

What plan shows (Titles such as "Details" will not be acceptable).

Unless otherwise specified by the Bureau no reference shall be made to any vessels.

Approval.—The following procedure shall be followed to obtain approval:

(a) Forward two blueprint copies of plans to Bureau via the Naval Inspector concerned, requesting master plan approval.

(b) The Bureau's action on plans will include decision as to its approval as a master plan and, if so approved, the assignment of a Bureau master plan number. If the Bureau's action requires altering the plan(s) two blueprints will be required to be submitted for final approval, if considered necessary; otherwise the Bureau will authorize the Naval Inspector concerned to authenticate the original tracing after it is altered to comply with the Bureau's action.

(c) Manufacturer adds the Bureau file number and date of the Bureau letter approving the plan(s) and the Bureau master plan number. The completed original cloth tracings and a photographically reproduced plan of the type specified in paragraph SI-1-m herein shall then be forwarded to the Naval Inspector concerned for authenticating signature.

(d) Inspector examines plans and, if found to be in accordance with the Bureau's action thereon, signs both the original and photographic tracing and forwards the photographic tracing to the Bureau for file, returning the original tracing(s) to the manufacturer. Provided there are no changes in master plan(s) or design of equipment to which plan(s) applies on subsequent

contracts, no additional copies of such approved master plan(s) will be required by the Bureau.

Changes.—Changes in design will have the following effect on master plans:

- 5 (a) Changes affecting interchangeability of equipment require new plans which will be assigned new Bureau master plan numbers. Approval procedure specified above shall be followed:

- 10 (b) Changes which do not affect interchangeability shall be shown on the plan(s) as alterations without changing the master plan number, except for the alteration number, which shall be changed to the next consecutive higher number. The Bureau shall be supplied with a photographic tracing of the altered plan.

- 15 (c) Changes to equipment which are only applicable to certain installations or a given class of vessels remove the plans for such altered equipment from the master plan category and shall be handled as ships plans.

- 20 In event of master plan procedure being in process for equipment on a specific contract, in order to avoid delay, the cognizant Bureau representative takes action on the plan in its relation to the specific contract by authorizing the shipbuilder or contractor to proceed with the work but reserving final action as to title block form and Bureau plan numbers pending the Bureau's action.

- 25 The local Bureau representative forwards prints and letter as specified in paragraph above to the Bureau, stating approval is desired as master plans; if Bureau approves application as master plan procedure will be as outlined for master plans if adaptation is disapproved the approval activity will require the plans to be furnished in form and number as required for ship plans.

- 30 The provisions set forth herein invoke the general requirements of the Master Plan System which apply to all equipment in the Master Plan category. The Bureau will furnish supplementary information, when requested, in the form of Master Plan procedure letters which will govern the details peculiar to any given item of equipment.

S1-1-h. General plan requirements

- 40 The Bureau's approval of any type of plan shall not relieve a shipbuilder or contractor of any material or performance obligation under the contract, unless a question in regard thereto has been brought to the Bureau's attention in writing, and specific waiver of such requirement by the Bureau has been obtained, (see section A1). All discrepancies discovered in plans and specifications, or between plans, specifications and contracts shall be immediately referred to the Bureau for action.

- 45 **Dimensions.**—In all cases, figured dimensions of all parts shall be complete and shall include manufacturing tolerances, working fits, and related data wherever applicable. All dimensions shall be given in feet, inches, and decimals or fractions of inches. Dimensions which apply to fitted parts shall be given in inches and decimal parts of inches with tolerances in decimals; dimensions of nonfitted parts shall be given in inches and decimal or common fractions; dimensions greater than 24 inches may be given in feet, inches, and fractions thereof.

- 50 All dimensions and/or notes shall be so placed on plans that they may be read either from the bottom of the sheet or from the right-hand side.

- 55 For dimensions on plans to be microfilmed, the requirements of paragraph S1-1-o shall be rigidly adhered to.

- 60 **Scales.**—All plans need not necessarily be made to scale, but, where practicable, scaled plans are preferred. When plans are not made to scale, such facts shall be

clearly stated in the plan title. Where plans are made to scale, one of the following standard scales shall be used, unless otherwise approved:

$\frac{1}{8}$ inch to the foot. 7

$\frac{1}{4}$ inch to the foot.

$\frac{1}{2}$ inch to the foot.

$\frac{3}{4}$ inch to the foot.

1 inch to the foot.

1 1/2 inches to the foot. 7

3 inches to the foot.

6 inches to the foot.

Full size or larger, as approved for small parts detail. 8

General lay-out plans for machinery installations shall be drawn to scales of not less than $\frac{1}{4}$ inch to the foot; however, larger scales are preferred when their employment will not unduly increase the dimension of the sheet. Specific exceptions to this general requirement are as specified under the applicable paragraphs of this specification.

Design.—Salient features of the design and performance characteristics of all apparatus shall be prominently shown on every plan where applicable. Such features shall include—

(a) Power input—pounds of steam per hour, kilowatts, pounds of oil per hour, etc.

(b) Power output (normal, rated, and overload)—horsepower, kilowatts, gallons per minute, etc.

(c) Pressure—steam, exhaust, suction, discharge, test, bearing, voltage, etc.

(d) Speed—revolutions or double strokes per minute, feet per second, bearing or journal surface speed, etc.

(e) Velocity (steam, liquid, air, gas)—through pipes and orifices, peripheral, etc.

(f) Temperature (inlet and outlet)—steam, liquids, etc.

(g) Surfaces (area of)—Heating, cooling grate, etc.

(h) Viscosities of liquids handled with corresponding temperatures. 1

(i) Power losses—in same units as (a) and (b).

(j) Heat transfer—Coefficient or rate.

(k) Boilers—See paragraph S1-1-i, herein.

(l) Smoke pipes and uptakes—Clear area through gas passages, uptakes, armor bars, etc. 1

(m) Weights—As a whole or by major subassemblies, calculated or actual (indicate which), wet or dry (specify different liquids).

(n) Power characteristics—Voltage, current, frequencies, number of phases, type and impedance of windings, starting torque, full-load speed torque, percentage of slip, speed adjustment, duty classification, etc. 1

(o) Characteristic curves—Steam consumption, horsepower, head, pressure, capacities, speed, efficiencies, etc.

(p) Capacity—At designed conditions in standard units. 1

Where parts of machinery are indicated as being right-hand or left-hand, a note shall be added to the plan explaining in detail the difference between the right-hand and left-hand parts. All plans of equipment using tubes, such as boilers, condensers, superheaters, feed-water heaters and other heat exchange equipment shall include a table showing number, ordering length, diameter, thickness, material, etc., of each type and size of tube required; the same applies to special brick in boiler combustion spaces. All plans of apparatus using electric cable or wire shall include a table giving length, size and type of all cable used. 1

Cross hatching.—Indicating the materials of construction by distinctive cross-hatching is not required on any class of plan; simple line hatching of complete sections or borders of separate parts shall be used wherever necessary to indicate a junction of two different pieces or otherwise to completely clarify the plan. When distinctive cross hatching is used, it shall conform to standard plan BuShips No. B-20.

Material list.—The materials of construction shall be indicated in a list of material in all cases, whether distinctive cross hatching is used or not. Since, under the provisions of section S1-2, the list of material becomes the medium of agreement between the Bureau and the shipbuilder or contractor as to the materials to be employed in construction, it is very important that extreme care be exercised in proper preparation. The list of material shall be provided in all cases at the right-hand end of all working detail and assembly plans, and on general arrangement plans when approval of the general arrangement plans involves approval of the material. The list of material for all plans, except piping (see paragraph S1-1-i) shall be arranged as follows:

Column 1—The piece number (in numerical sequence, 1, 2, 3, etc.).

Column 2—Name of piece (designated by noun, descriptive adjective, location, and size where applicable).

Examples: Dowel-Taper, Bearing Case.
Bolt, Special —, —, —

Column 3—Number required, see page 7, lines 23 to 37.

Column 4—Kind of material.

Column 5—Applicable material specification.

Column 6—Manufacturer's service part number; a constant number, assigned by the manufacturer, which is the infallible identification of a service part wherever used.

Column 7—Contractor's plan number.

Column 8—Bureau plan number.

Column 9—Unit weight per piece (finished).

Column 10—Remarks.

Navy Department, Bureau of Ships or Federal Specifications, where applicable shall be listed in column 5. Where none apply, specify "commercial." Where the specification is listed as "commercial," additional information as to the properties of the material shall be added in a footnote so that proper inspection can be made.

Commercial items or items purchased for installation in the equipment, such as bearings, or seals, shall be recorded with the size, prime manufacturer's name and the prime manufacturer's part number.

Referenced specifications in list of material shall be identified by adding footnote to effect that "Except as otherwise noted, Navy or Federal Specifications are the issues in effect on Replacements (Date)

may be made in accordance with later issues, provided interchangeability permits." The date to be inserted shall be as specified in the Special Specifications. When specifications of an issue later than that specified are used, identify by adding date of issue.

When plans are in accordance with the Master Plan System, see paragraph S1-1-g, the words "Master Plan" shall be inserted in column 5 and the plan numbers in proper columns for plans in this classification. References shall be complete and permit ready identification of any part or subassembly. Spare parts column require-

ments for master plans shall be as specified in supplementary procedure letters for a given item of equipment.

Addition of service part number in list of material on preliminary and working plans shall not be cause for delay in forwarding of these types of plans for approval, if service parts numbers are not immediately available. However, service part numbers shall be recorded on all corrected plans, and master plans.

When it is the manufacturer's practice to assign part numbers to all pieces, these shall be recorded on the proper plans. Where part numbering systems do not exist, the manufacturer shall be required to assign part numbers as specified for column 6 above and record on the proper plans those parts and subassemblies which will be furnished as ship-board or shore-based spares, plus all other parts and subassemblies which in the judgment of the manufacturer, may require replacement during the life of the machinery (i. e., wearable parts).

Service assemblies and subassemblies which are minimum repair or replacement items shall be assigned service part numbers and the plans for the parts thereof shall be marked clearly, "Not Serviced Separately."

Insert in "Remarks" column the grade, class, type, or style applicable, as listed in the specification. References to notes and other pertinent remarks shall be placed here also.

In cases where the manufacturer proposes a substitution for the material specified, sufficient detail as to analysis, tests, heat treatment, and such explanatory data as will permit the Bureau to take proper action without further correspondence shall be included in forwarding letter with plan for approval and substitution entered on plan in such form that proper inspection can be made if substitution is approved. The Bureau, in acting on the plan, will either accept or return this plan with a list of items requiring revision, and having been agreed upon, and approved, the specification column with its footnotes shall serve as the inspecting officer's guide as to the degree of inspection such as full or surface inspection which shall be applied, see section S1-2. Additional columns will be permitted in the list of material to suit the special requirements of a shipbuilder or contractor, but there shall be no omissions from the information called for.

Finishes.—Surface finish shall be indicated for all parts. Where practicable, Bureau standard symbols and method of indicating them shall be used as shown on standard plan, BuShips No. B-100: where the shop practice of a given manufacturer requires symbols differing from the Bureau's standard, the manufacturer's symbols will be acceptable, provided a table correlating the manufacturer's and the Bureau's symbols is provided.

Titles.—The right-hand side of plans shall be reserved for titles, list of material, explanatory notes, etc., which shall conform to standard title block, plan BuShips No. S0103-655774 for arrangement.

The titles of all plans shall be complete, and for all plans except master plans shall have the official designation of all vessels to which the plan applies, as obtained from the Special Specifications therefor or from the Bureau; viz, BB45, DD240, etc., unless otherwise approved by the Bureau. In order to avoid confusion due to possible changes in names of vessels, the names shall be omitted from all plans and booklets. The identity of a vessel will be definitely established by the official class and serial identification number as specified above.

Each assembly plan of a set for a given item of

apparatus or equipment shall carry a plan list or index showing all other plans of the set by the titles and Bureau plan numbers for ready reference. In cases where such a list is too extensive for detailing on the assembly plan, a separate plan shall be prepared for this purpose.

All detail plans shall bear a note referring to the assembly plan of which they form a part.

Welding.—When welding is to be used, all plans shall show welding details clearly and concisely by either detailing the joint or by using the welding symbols of Section A2 of Appendix VII of the General Specifications for Inspection of Material.

Spare parts and tools.—It is of the utmost importance that the details of the spare parts and special tools to be furnished under any requisition, contract or order be clearly shown on plans and designated by part number. In general, a detailed list of spare parts and special tools to be furnished per vessel, and/or per requisition, contract or order, shall be shown on the general assembly plan for the equipment in question. In cases where such a list would be too extensive for detailing on the assembly plan, a separate plan shall be prepared for this sole purpose. The form for List of Material shown in this paragraph shall be used for spare parts and tools. The column headed "Number Required" which shall be subdivided into columns titled "Installed" and "Spare" does not relieve the shipbuilder or contractor from the responsibility for furnishing a detailed summary of spare parts and special tools on the general assembly plans or separate special plan, as the case may require. Final Bureau approval of the spare parts and special tools will be given on the assembly plans, or special plans, in each case, and not on detailed plans. In particular, when sets of spare parts for a particular equipment are called for by the requisition, contract or order, such as "complete sets of bearings," the summary of spare parts shall show in detail what items constitute a set.

Bearings.—In all applications of antifriction bearings of ball or roller types, the assembly plan of the apparatus shall bear a certificate signed by a responsible representative of the bearing manufacturing company showing that the application of each particular bearing proposed for use is approved by his company as to all details of mounting shown, the load and speed to which the bearing will be subjected and the lubrication of the bearing, giving full consideration to the intended service; viz, continuous or intermittent, ambient temperature, disassembly requirements.

S1-1-i. Mechanical plan requirements

General.—In general, mechanical arrangement plans showing the installation of equipment, other than electrical equipment shall show the major items of electrical equipment, including the main wireways, so as to insure against interference with the electrical equipment and wireways and against the possibility of piping and ventilation ducts dripping or directing water on the electrical equipment.

Boiler plan requirements.—In addition to conforming to the applicable general plan requirements specified in this section, the assembly plan(s) of the main boiler and/or separately fired superheater shall be a front elevation in half section and shall have incorporated thereon the following data for the full-power capacity.

- (a) Designed pressure—pounds per square inch gage.
- (b) Steam drum pressure—pounds per square inch gage.

- (c) Operating pressure—pounds per square inch gage.
- (d) Superheat—degrees F.

(e) Minimum satisfactory steam flow (separately-fired superheaters only), pounds per hour.

(f) Air preheater, initial and delivered air temperatures—degrees F.

(g) Economizer, initial and delivered feed temperatures—degrees F.

(h) Generating surface—square feet.

(i) Superheater surface—square feet.

(j) Economizer surface—square feet.

(k) Air preheater surface—square feet.

(l) Furnace volume—cubic feet.

(m) Steam releasing surface in steam drum—square feet.

(n) Refractory surface—square feet.

(o) Radiant heat absorbing surface—square feet.

(p) Ratio, radiant heat absorbing surface to refractory surface.

(q) Outside diameter, thickness and number of generating, superheater economizer and air preheater tubes in the unit.

(r) Ratio, length to inside diameter of A—row tubes.

(s) Type and number of fuel-oil burners installed.

(t) Designed rate of actual evaporation—pounds steam per hour.

(u) Designed rate of combustion per hour—pounds oil (of 18,500 B. t. u. per pound); and in kilo—B. t. u. (KB).

(v) Designed rate of combustion per burner per hour—pounds oil (of 18,500 B. t. u. per pound).

(w) Draft losses—inches of water:

(1) Total draft loss from burner register through boiler at full power including economizer and/or air preheater.

(2) Draft losses through other air and gas paths, including through air casing to burner register for air encased boilers.

(x) Designed rate of combustion per hour, per square foot of total heating surface (generating, superheater, and economizer)—KB per square foot.

(y) Designed rate of combustion per hour per square foot radiant heat absorbing surface—KB per square foot.

(z) Designed rate of combustion per hour per cubic foot furnace volume—KB per cubic foot.

(aa) Designed capacity, steam pressure drop and exit steam temperature of the desuperheater (if installed).

(bb) Weight—total, pounds (dry).

(1) Pressure parts exclusive of fittings, pounds.

(2) Internal fittings, pounds.

(3) External fittings pounds including burners, soot blowers, and safety valves, but not including main steam stop valve.

(4) All casing plating and framing, pounds.

(5) All casing and furnace insulation and refractory, pounds.

(cc) Weight (dry) per pound steam, equivalent evaporation (at 212° F.) at full power.

(dd) Weight of water (level at horizontal center line of steam drum) at steaming temperature.

The tube table shall be arranged by designating generating tube rows in each tube bank by letters without omission of any letter of the alphabet from the furnace row out, using double letter designations for tube rows over 26. Where the two tube banks are different the designating letters shall be preceded by "L" or "R" to

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indicate the hand of the bank. Superheater tube rows shall be numbered from the furnace side out.

Detail plans of steam and water drums shall have incorporated thereon the allowable pressure, resulting from the actual thickness of drums and heads, using the design factors of safety and the minimum specified tensile strength of the material used. The specified tolerance of the inside diameter for departure from true circularity shall be stated on the plans.

- 10 The designed water level shall be plainly indicated on the assembly and appropriate detail plans.

- 15 Plans of furnace refractory shall have incorporated thereon notes describing the method of installation and baking of plastic fire clay refractory (244-8-5384 (Hjio)) as given in section S51-2. If special refractory shapes are used for forming fuel-oil burner openings, these plans shall also contain a note specifying that no spare refractory shapes for these openings are furnished and plastic fire clay refractory shall be used when replacement is necessary.

- 20 Where the length and shape of boiler, superheater or economizer tubes and the space available for their renewal is such that a special procedure is required for such renewal, a plan or plans showing the method of and containing all necessary instructions for renewing these tubes, shall be included in the working and corrected plans.

- 30 Plans showing the installation of lifting gear required by section S92-1 and containing all necessary instructions for such installation and the procedure to be followed for withdrawing and replacing superheaters of the integral type shall be included in the working and corrected plans.

- 35 There shall be incorporated on the plan showing the arrangement of tubes or on a separate plan if necessary, a cross-section through each tube bank, midlength of the bank if the tube rows are parallel or at the section of smallest clearances if any tube rows are not parallel to the other rows, showing the longitudinal and diagonal spacing of the tubes of each size and giving the dimensions of the designed longitudinal and diagonal spacing of each row of tubes. The cross-sectional views shall also show the location of the superheater tubes with respect to the generating tubes in the location at which the section is taken.

- 45 Piping.—In addition to conforming to the applicable general plan requirements of this section the following information shall be furnished for all plans of piping systems:

(a) For piping diagrammatic plans:

- 50 (1) A complete diagrammatic representation of the system, illustrating by notes or by numbered or lettered symbols each component part.
- 55 (2) A table of symbols with the corresponding names.
- (3) A table giving the rated and full power capacity of all principal units, including capacity and total head ratings of pumps.
- (4) The estimated oil supply to each turbine and reduction gear bearings and gears.
- 60 (5) Pipe sizes, rated and maximum flow, velocities, estimated pressure drop in main lines.
- (6) Working pressure.
- (7) Test pressures.
- (8) Material and material specifications.
- 65 (9) Relief and reducing valve settings.

- (10) Notes covering safety features where necessary.

(11) Direction of flow.

(b) For piping arrangement plans:

- (1) Direction of flow in run of pipe. 70
- (2) Pipe sizes shall be indicated on the plan to identify each run of pipe.
- (3) Pipes, valves, and fittings shall each have the same letter prefixed to the piece number, e. g., F for fittings, P for pipes, and V for valves. 75
- (4) All drain connections.
- (5) List of material for piping, including the following:

- Column 1—Piece number in numerical order.
- Column 2—Service (e. g., fuel oil discharge to tank No. 1). 80
- Column 3—Location (frame—port or starboard).
- Column 4—Nominal diameter.
- Column 5—Outside diameter.
- Column 6—Thickness of pipe. 85
- Column 7—Length of pipe (estimated).
- Column 8—Material.
- Column 9—Reference material specification.
- Column 10—Detail plan number (Bureau and contractor). 90
- Column 11—Remarks.

(6) List of valves including the following:

- Column 1—Piece number in numerical order.
- Column 2—Service.
- Column 3—Type (gate, globe, etc.). 95
- Column 4—Location (frame—port or starboard).
- Column 5—Nominal size.
- Column 6—Body material.
- Column 7—Material. *Pressure*
- Column 8—Referenced material specification. 100
- Column 9—Bureau standard or detail plan number.
- Column 10—Manufacturers plan number.
- Column 11—Remarks.

- (7) List of fittings including same data as noted for List of Valves above. 105

- (8) Piping arrangement plans for machinery spaces shall be drawn to scales of not less than $\frac{1}{8}$ -inch to the foot, but larger scales are preferred when their employment will not unduly increase the dimension of the sheet. 110

Propellers.—In addition to conforming to the applicable general plan requirements of this section, plans for screw propellers shall be in accordance with standard plan, BuShips No. 5244-300. Propeller plans shall include the following data: 115

- (a) Number of blades.
- (b) Diameter.
- (c) Pitch.
- (d) Developed and projected areas of blades. 120
- (e) Disk area.
- (f) Ratio of projected area to disk area.
- (g) Mean width ratio.
- (h) Blade thickness (fraction).
- (i) Pitch ratio. 125
- (j) Weights of propeller and hub.
- (k) WR^2 of propeller and hub.
- (l) Shaft horsepower.
- (m) Effective horsepower.

- (n) Shaft r. p. m.
- (o) Displacement and speed of vessel for which propeller is designed.

5 Zincs.—In addition to conforming to the applicable general plan requirements of this section, the plan for zincs shall contain data for all zincs installed throughout the vessel and shall be in accordance with standard plan, BuShips No. 5000-S4823-841055.

10 Data contained in this plan shall include the following in sufficient detail to enable ready location and maintenance of the zincs:

- (a) Location.
- (b) Type.
- (c) Number.
- 15 (d) Recommended frequency of inspection, cleaning, and replacement.
- (e) Record data.

20 Plans furnished the vessel for plans of this nature shall be of white background type which will permit writing or drawing thereon.

S1-1-j. Electrical plan requirements

25 General.—In general plans showing runs of wire leads and structural work together shall have the wire leads shown as heavy lines, and structural work (outlines of decks, bulkheads, etc.) in light lines.

Working wiring deck plans shall be of ¼-inch scale on surface vessels and ⅛-inch scale on submarines or larger as required for satisfactory legibility.

30 All working deck plans and general arrangement plans showing electrical wiring, shall have all structural work shown (such as doors, hatches, skylights, stanchions, manholes, removable plates, together with their names and compartment numbers, etc.) which might in any way affect the run of the electrical wireways.

35 Isometric plans shall be of a suitable scale as required for satisfactory legibility. All isometric plans showing electrical wiring shall have all structural compartments shown.

40 The symbols used on plans to indicate type of appliances, and fixtures shall be in accordance with standard plan, BuShips No. 9000-S6000-73387. Each plan on which appliances and fixtures are shown by a symbol shall, for convenient identification, have on it a table which shall show in parallel columns each symbol used with its name and/or descriptive identification; this applies in particular to isometric and working wiring deck plans. All cables shown on plans shall be identified in accordance with section S28-2. Where Bureau standard forms are available they shall be followed in the preparation of plans.

50 Working wiring deck plans shall be submitted after diagrammatic (elementary and isometric) plans have been approved, and shall show the proposed location and type of fixtures, approximate location of motors and motor generators, fans, interior communication (I. C.) and fire control (F. C.) instruments, and all other electrical apparatus, complete wiring, nature of wireways, and all appliances such as feeder junction boxes, feeder distribution boxes, distribution boxes, switches, receptacles, etc. Cable ends to be sealed shall be indicated on power and lighting deck plans and interior communications and fire control isometric diagrams by the symbol shown on plan, BuShips No. 9000-S6000-73387.

65 Each system wiring plan shall have a reference plan table referring to all other plans of the system (this includes elementaries, isometrics, deck, and feeder lists);

this table shall list in parallel columns both the ship-builder or contractors' and Bureau numbers with alterations of each. In the case of deck plans, one of the decks (preferably the hold forward) only, shall bear the list of reference plans and their respective alteration numbers. In case of alteration to one of the system plans, it will therefore be necessary to change only the alteration numbers of reference plans on this single deck plan.

75 The schedule of plans of electrical installation and the elementary diagram of the power distribution system shall be submitted at the earliest practicable date after award of contract. All power systems, lighting system, and general plans as listed in paragraph S1-1-i, shall be submitted for approval in the general order listed in that paragraph.

80 On elementary and isometric wiring diagrams, switch-board wiring diagrams, and on deck plans, the extensive use of single lines to represent several cables, is unsatisfactory; a limited use of single lines for this purpose will be satisfactory. However, this shall be limited to instances where a group of leads start at one point (as at a panel or terminal board) and all proceed in the same direction to and in one general vicinity—and in these instances there should be no branches off the main single line run; wherever the single line scheme is used the leads shall be carefully labeled at each end of the single line where they are again separated.

85 All interior-communication and fire-control plans shall be submitted for approval. One system only shall be shown on a sheet. When practicable, equipment plans shall be submitted prior to the submission of installation plans. Additional plans which may be necessary to show special features or points not otherwise clear shall be submitted as required. Deck plans shall show general arrangement and wireways, including location of junction boxes, distribution boxes, and other principal wiring appliances.

90 The diagrams on lists of lighting feeders and mains shall show the number of each and every circuit and circuit section (feeders, mains, submains, and branches). In this numbering care must be exercised in order to leave numbers available in sequence for each spare connection in a box (each spare on a box should be shown by a stub line).

100 The actual installation shall be accomplished in accordance with approved working plans of the electrical installation, except for such changes and developments as are approved which shall immediately be incorporated into the working plans. In this connection it shall be noted that working wiring deck plans need not necessarily show exact electrical equipment, as it is considered sufficient that the working wiring deck plans show these items in their proper compartment and in their approximate locations. Corrected plans shall be furnished in accordance with paragraph S1-1-f.

105 Multisheet electrical plans (plans requiring more than one sheet) shall be assigned one file number with sheet numbers as required. This shall include such plans as the following:

- 125 Electrical data for motor-driven auxiliaries.
- Lists of feeders and mains.
- Power analysis and summary of feeders.
- List showing switch arrangements.
- Distribution panels.
- 130 List of fixtures and appliances, etc.
- Illumination survey data.

Split plans shall be included where it is necessary because of the length to split a plan such as Elementary Diagram of Power Distribution System. This does not apply to multisheet plans of apparatus such as switchboards, generators, etc.

The general plans, required by paragraph S1-1-l, shall be entitled "General arrangement of electrical equipment in _____" and shall include the following minimum information:

(a) Outline views of all electrical equipment in the compartment (shown in heavyweight lines).

(b) Location of all stanchions, hatches, doors, vent ducts, beams, manholes, salt-water pipes, fresh-water pipes, etc.

(c) Outline views of all other equipment in the compartment, such as Diesel engines, turbines, etc. (shown in lightweight lines).

(d) Outline views only of wireways. Individual detail run of cables are specifically not desired.

(e) A small scale sketch showing the relation of the compartment to surrounding compartments, including accesses, etc.

Where plans showing the detail run of individual cables in the various compartments are required by the shipyard they shall be entitled "Arrangement of wiring installation in _____" These plans should not be forwarded to the Bureau for approval or file unless specifically requested.

Switchboards.—Plans for switchboards and panels shall be in accordance with the following, unless otherwise specified.

(a) A dimensional front and plan view of the switchboard, showing all limiting dimensions including clearance necessary for hinged panels and all apparatus mounted on the front.

(b) A dimensional rear and plan view of the switchboard, showing bus structure, bus sizes and spacing, supports, and assembly methods.

(c) Dimensional section views, front, rear, and side vertical; and horizontal section views; in sufficient number to show arrangement and location of equipment and buses; clearances; and sizes of steel frame members. Proposed arrangements for incoming cables and feeder cables shall be shown with supports and methods of installation.

(d) A dimensional floor or mounting plan to show arrangement of footing or mounting members and anchor bolt drilling.

(e) Name plate list with fuse or trip element data; complete list of material with names of all parts, part numbers, Bureau of Ships certificate of approval or plan number or specification number, together with material and total weights; and list of spare parts. All switches, circuit breakers, contactors, resistors, etc., shall be marked to show their current carrying capacity and voltage rating, where applicable.

(f) Complete wiring diagram, showing bus sizes, feeder numbers, terminal blocks, circuit breaker, switch and fuse sizes, cable sizes and name plate numbers. All electrical appurtenances shall be marked or indicated by piece numbers, to readily identify them with the corresponding part on the list of material. Where five or more single lines used to represent several leads, parallel each other on the plan, they shall be separated into groups (two or three to a group as convenient), to facilitate following with the eye, instead of having them all uniformly spaced. See page 9, lines 82 to 93.

(g) A single line diagram of metering, relaying, and control circuits. This diagram shall show the major bus circuits, the number and location of all instrument and control transformers, the instruments, relays and other equipment connected to each transformer, and the location of the instruments in relation to the various switchboards. The diagram shall be included among the plans in the instruction book.

(h) A plan showing the application and coordination of protective devices and an analysis of fault currents as required by section S62-5. (See standard forms, plans, BuShips Nos. 9000-S6202-73264 and 9000-S6202-73265.)

(i) Detail plans of appurtenances as required. Where appurtenances are required to be of approved types, for which "Test Record Plans" are furnished the Bureau, no working or corrected plans of such appurtenances will be required. However, the shipbuilder or contractor shall reference each "Test Record Plan" covering appurtenances, and the items in question shall conform completely with such plans, unless otherwise noted. If supplementary, assembly, outline, or detail plans of such items are necessary, in the judgment of the Supervisor of Shipbuilding, for the purpose of proper inspection, or identification of spare parts, they shall be furnished by the shipbuilder or contractor.

(j) A typical construction plan, showing details of framework, details of attaching front panels, details of joining structural members including bolting, location and types of welding, details of fuse boxes, number and size of bolts used for supporting breaker bases, breaker mounting straps and bus supports, details of hinging panels including latches and stops, methods of supporting copper, and type of guard rails and other details of construction not shown in sufficient detail on other plans.

The plans shall show piece numbers, nameplate numbers, and device numbers where necessary and these shall agree with the corresponding numbers on the name-plate list and list of material. The list of material and spare part list shall show the manufacturer's name and all sufficient information to readily identify the equipment in case replacement or purchase of new material is necessary.

S1-1-k. Electronic plan requirements

Wiring.—The following applies to radio communication equipment. Requirements for other electronic equipment circuits are identical except that a separate elementary wiring and isometric plan shall be furnished for each electronic system circuit, other than for sonar equipment, in which case a single plan for the complete system installed in a vessel shall be provided.

(a) The elementary wiring plan of the complete radio communication system installation in a vessel shall preferably be on the sheet and include all radio communication system apparatus to be installed in all spaces. No other apparatus or wiring except radio communication system shall be included on this plan. Each space, in which radio communication system apparatus is to be installed, should be indicated on plan by an outlined area appropriately labeled and each unit of the various equipments indicated therein by block method. Each cable between units within a space and between spaces may be indicated by single heavy lines. Single lines to represent more than one cable should not be used. Each lead shall be marked with cable type and designation. Power supply wiring between the radio communications system power panels and the apparatus, or receptacles therefor, shall be included. Transmitter remote control, radio-

phone, frequency meter and receiver extension circuits and antenna bus circuits, shall be in accordance with type plans furnished by the Bureau. Interconnection of equipments shall be in accordance with installation plans which comply with N. D. Spec. 16D15(RE) or instruction books furnished by the manufacturers of the equipments or by the Bureau.

(b) Isometric wiring plans of the radio communication system installation shall include only that portion of the different decks traversed by radio communication system cables and transmission lines. All cables between radio spaces, radio direction finder stations, remote control stations, motor-generator space, etc., shall be included on this plan. All leads shall be marked with cable type and designation to agree with the elementary wiring plan.

Arrangement.—

(a) A plan view and an elevation view of each bulkhead in which electronic equipment (radio, radar, sonar, IFF, counter measures, beacon, or direction finder equipment) is concerned, shall be shown for each electronics system space in which an appreciable amount of electronic equipment is installed. Spaces in which only remote stations units, such as radiophone, key-control and jackbox units are installed, need not be included on electronic equipment arrangement plans. Remote radar repeaters, however, are considered major pieces of equipment for which arrangement plans are desired. All electronic equipment and associated material shall be indicated by heavy lines. Structural members, ventilating ducts, piping, electrical equipment, interior communication equipment and all other apparatus or material, which may or may not affect the arrangement of electronic equipment, should be indicated in phantom outline by light lines. No wiring except antenna busses, and connecting leads thereto shall be shown on arrangement plans.

(b) Arrangement plans of topside antennas shall include an elevation view (profile) and a plan view if necessary to clearly show all antennas. The plan shall show all radio transmitting, receiving and direction finder sense antennas, radar, IFF, countermeasures, beacons and their lead-ins to the point of entrance. Routing, points of attachment, yardarms, outriggers, pendants, insulators, clamps, protective ducts on masts and size, type and length of transmission line, wave guide or cable should be indicated on these plans. Data on antenna weights, working circles, center of gravity, and center of wind pressure shall also be indicated on topside antenna arrangement plans where applicable.

(c) Arrangement plans of antenna trunks, wave guide and transmission line runs shall show the routing, size, length, size of conductor, type and number of supporting insulators, special fittings and all pertinent installation design features such as access openings and means of assembly and disassembly.

Miscellaneous.—

(a) Detailed plans shall be furnished covering all electronics equipment furnished by the shipbuilder, except where specifically waived. This requirement is not intended to include minor items of incidental installation material such as cable, stuffing tubes, clamps, brackets, etc., but only major items of electronics apparatus furnished by the shipbuilder. Plans shall include sufficient details to permit manufacture therefrom.

(b) The list of electronic equipment plans shall include information grouped under the following headings where applicable. Symbol or symbol number (or both), quan-

tity, Navy model or type; description, serial number, supply voltage, ship's power required, weight, Bureau plan number, manufacturer's plan number, remarks and any other information desired added by the shipbuilder.

(c) Symbols on plans for electronics installations used to indicate abbreviations, equipment, color coding and related items, shall be in accordance with N. D. Spec. 16S12 (RE).

S1-1-1. List of working plans and corrected plans

In order to obtain uniformity in the preparation of working plans and particularly corrected plans, the following lists of subject items for such plans are given. For certain vessels some items listed do not apply; for others, necessary items may have been omitted. The lists are not intended to be exhaustive but are furnished as a general guide; omission of any important item shall not be construed as relieving the shipbuilder of the responsibility for furnishing either type of plans pertaining to same if required. It shall be understood that these items are meant to include only mechanical, electrical, or electronic work which is under the cognizance of the Bureau of Ships.

Mechanical plans.—For the following items, arrangement or assembly plans will be required with such detail plans or information as are necessary for a clear understanding of the item and to permit reproduction of parts which are subject to wear or breakage and which may require replacement. The details of parts may be on the same sheet as the arrangement or assembly plan, may be in form of a descriptive note, or may be on one or more separate sheets.

- (a) Bilge drainage system, machinery spaces.
- (b) Fire extinguishing systems, machinery spaces.
- (c) Floor plates, machinery space.
- (d) Forced-draft system.
- (e) Foundations, engine rooms and firerooms.
- (f) Gear, valve operating for control of damage.
- (g) Gratings, machinery spaces.
- (h) Guards, main propulsion units.
- (i) Heating system:
 - (1) Steam, living spaces.
 - (2) Coils, fuel-oil tanks.
- (j) Indicators:
 - (1) Temperatures.
 - (2) Fuel-oil tank gage.
 - (3) Smoke.
- (k) Ladders, machinery spaces.
- (l) Lagging and heat insulation.
- (m) Machinery arrangements.
- (n) Main gage boards.
- (o) Oil-purification apparatus.
- (p) Piping.
- (q) Protective devices, electric-propulsion controls.
- (r) Repair shops.
- (s) Smoke pipes.
- (t) Switching structure, electric-propulsion control.
- (u) Tanks, air.
- (v) Trial equipment.
- (w) Uptakes, boiler.
- (x) Ventilating system, machinery spaces.
- (y) Whistles and sirens, steam and electric (plan showing arrangement of piping submitted separate from mechanical pulls).
- (z) Zincs. (See paragraph S1-1-i.)

(aa) Hose (See paragraph S1-1-i.)

For the following items, assembly and complete detail plans will be required:

	(a) Air accumulators:	
5	(1) Compressors.	
	(2) Ejecting apparatus for condensers.	
	(3) Flasks and plugs, Diesel engines.	
	(4) Starting and reversing gears, Diesel engines.	
	(b) Air conditioning plant, refrigerating equipment.	
	(c) Augmenters, vacuum.	
10	(d) Auxiliary machinery:	
	(1) Whistles, navigational, steam or compressed air.	
	(2) Sirens, steam or compressed air.	
	(3) Governors, pump pressure regulating.	
15	(e) Bearings:	
	(1) Main shafting.	
	(2) Main thrust.	
	(3) Turbine thrust.	
	(f) Blowers:	
20	(1) Forced draft, fire rooms.	
	(2) Soot.	
	(3) Ventilating, electric propulsion equipment.	
	(g) Boilers:	
	(1) Auxiliary.	
25	(2) Main. (See par. S1-1-i herein.)	
	(h) Bolts, holding down, main propulsion units.	
	(i) Cables, electric-propulsion units.	
	(j) Circuit breakers.	
	(k) Clutch gear, main propulsion.	
30	(l) Condensers.	
	(m) Coolers.	
	(1) Air.	
	(2) Oil.	
	(3) Water.	
35	(n) Distilling plant and auxiliary equipment.	
	(o) Educators.	
	(p) Engines, main propelling, and auxiliary.	
	(1) Internal combustion engines.	
	(2) Steam engines.	
40	(q) Expansion couplings, shaft.	
	(r) Expansion joints for piping.	
	(s) Fair-waters.	
	(t) Filters, air, condensate, gasoline and lubricating oil.	
45	(u) Fittings, steel, main and boiler pressure auxiliary steam and main feed.	
	(v) Gages:	
	(1) Bridge.	
	(2) Turbine clearance.	
50	(w) Gear, handling:	
	(1) Lifting, for important machinery.	
	(2) Operating:	
	(a) Main engines.	
	(b) Smoke pipe.	
55	(c) Damper.	
	(d) Valve.	
	(3) Turning or jacking, main propulsion units.	
	(x) Generators, main propelling.	
	(y) Governors:	
	(1) Auxiliary units.	
60	(2) Main propulsion units.	
	(z) Grease extractors.	
	(aa) Hangers for steam piping and main feed piping.	
	(bb) Heaters:	
65	(1) Water.	
	(2) Oil.	
	(cc) Indicator gear:	
	(1) Auxiliary units.	
	(2) Main engines.	
	(dd) All Interior-communication equipment.	
	(ee) Insulators, electric-propulsion cable.	70
	(ff) Interlocks, electric propulsion.	
	(gg) Lubrication:	
	(1) Auxiliary units.	
	(2) Main propulsion units.	
	(hh) Mandrels for white metal, main bearings.	75
	(ii) Meters, torsion.	
	(jj) Micrometer gear, main-propulsion units.	
	(kk) Motors, electric propulsion.	
	(ll) Mufflers, exhaust, internal-combustion engines.	
	(mm) Oil fuel system.	80
	(nn) Packing:	
	(1) Gland:	
	(a) Auxiliary turbine.	
	(b) Main turbines.	
	(2) Metallic, main engines.	85
	(oo) Potheads, propulsion cables.	
	(pp) Propellers. (See par. S1-1-i.)	
	(qq) Pumps.	
	(rr) Reduction gear, main propulsion units.	
	(ss) Refrigerating plant.	90
	(tt) Regulators, boiler feed water.	
	(uu) Relays, electric-propulsion control.	
	(vv) Rheostats, electric-propulsion control.	
	(ww) Separators:	
	(1) Oil.	
	(2) Steam.	95
	(xx) Shafting, main propulsion.	
	(yy) Strainers:	
	(1) Macomb.	
	(2) Oil.	100
	(3) Steam.	
	(zz) Stuffing boxes:	
	(1) Bulkhead:	
	(a) Pipe.	
	(b) Shaft.	105
	(2) Main engine.	
	(3) Stern tube.	
	(aaa) Switchboards, electric-propulsion control.	
	(bbb) Switches, electric-propulsion control.	
	(ccc) Tanks:	110
	(1) Air.	
	(2) Drain.	
	(3) Feed and filter.	
	(4) Ice making.	
	(5) Oil.	115
	(ddd) Tools, special.	
	(eee) Transformers, electric propulsion.	
	(fff) Traps, open bucket, float, impulse and continuous flow.	
	(ggg) Turbine, special control, main propulsion units.	120
	(hhh) Turbines:	
	(1) Auxiliary.	
	(2) Main propulsion.	
	(iii) Valve and valve manifolds:	
	(1) Boiler blow.	125
	(2) Check, above 2 inches, where not standard.	
	(3) Feed, stop-and-check.	
	(4) Gate above 2-inches (where not standard).	
	(5) Globe, angle and cross above 2-inches, where not standard.	130
	(6) Injection and overboard discharge.	
	(7) Reducing or regulating.	
	(8) Relief.	
	(9) Safety, boiler.	

(10) Sea.

(11) Spring-loaded or pressure-regulating, exhaust.

5 (12) Stop and cut-out valves in main steam boiler pressure, auxiliary steam, and main feed lines.

(13) Throttle and control.

For certain classes of equipment, such as those where mechanical fit is not an object, where it may be impracticable for the manufacture of replacement parts to be attempted by naval personnel, or where the item in question is in accordance with approved Bureau of Ships standard plans or so standardized industrially as to be readily obtainable by purchase in practically any United States port, working and corrected plans in the form specified above will not be required. In lieu of hand tracings or photographic tracings, however, sufficient information shall be supplied with preliminary plans in the form of photographs, illustrations, printed matter, and other data, to enable the equipment in question to be readily understood and to permit all parts to be ordered for replacement. The following list of items is given as indicative of such equipments:

- 25 (a) Bolt forcercs.
- (b) Calorimeters.
- (c) Chain blocks.
- (d) Cleaners, tube.
- (e) Clopsks, nonelectrical.
- (f) Electrical metering instruments, switchboard and portable.
- 30 (g) Flue-gas analyzing outfits.
- (h) Fuses.
- (i) Gages (steam, vacuum, air, water, and oil) except special types.
- 35 (j) Indicators:
 - (1) Diesel engine.
 - (2) Steam engine.
- (k) Instruments, electric propulsion.
- (l) Joints, universal and ball tooth.
- 40 (m) Meters:
 - (1) Oil.
 - (2) Water.
- (n) Pyrometers.
- (o) Springs.
- 45 (p) Thermometers.
- (q) Transformers, instrument.
- (r) Tools:
 - (1) Hand (except special wrenches, etc.).
 - (2) Machine (except motors and other electrical equipment).
 - (3) Workshop.
- 50 (s) Traps, low-pressure and vacuum, thermostatic.

Electrical plans.—The following plans of electrical installation of vessels are listed to be furnished by the contractor:

55 (a) *Power system*.—Plans within any of the type groups such as elementary or isometric diagrams grouped below shall normally be furnished as individual plans. In all cases, details of the power supply, such as transformers, power rectifiers, motor generator sets, and other related equipment, shall be shown up to the basic power consuming equipment.

- 60 (1) Schematic (abbreviated) diagram of power distribution system. Refer to contract plans.
- 65 (2) Elementary diagram of power distribution system. (See also page 15, lines 11 to 93.)

(3) Elementary wiring diagram of degaussing system.

(4) Elementary wiring diagram showing all ship's service and emergency power supplies to electronic equipment.

(5) Elementary diagram of electric furnace power and control.

(6) Elementary diagram of all systems of remote control of circuits.

(7) Elementary diagram of control and starting circuits of emergency generator starting.

(8) Isometric wiring diagram of ship's service system.

(9) Isometric wiring diagram of emergency system.

(10) Isometric wiring diagram of circuits and outlets for submersible pumps, portable arc welding sets and 440-volt portable tools.

(11) Isometric wiring diagram of circuits and outlets for permanent arc welding installations.

(12) Isometric wiring diagram of power circuits to and in gun turrets and mounts.

(13) Isometric wiring diagram of degaussing circuits, connection boxes, and control circuits.

(14) Isometric wiring diagram showing all ship service and emergency power supplies to electronic equipment.

(15) Isometric wiring diagram of circuits and outlets for main propulsion.

(16) Working wiring deck plans.

(17) Deck plans showing location of degaussing cables relative to decks, bulkheads, and ship's sides.

(18) Generator and distribution switchboards and switchgear groups. (See par. S1-1-j.)

(19) Ship's service electric power system, application and coordination of protective devices. (See standard form, plan, BuShips No. 9000-S6202-73264.)

(20) A. C. power system fault current analysis. (See standard form, plan, BuShips No. 9000-S6202-73265.)

(21) Electrical data for motor driven auxiliaries. (Standard forms—plan, BuShips No. 9-S-4729-L for A. C.—plan, BuShips No. 9000-S6303-73231 for D. C.)

(22) Preliminary (abbreviated) electrical power analysis. (Standard form, plan, BuShips No. 9000-S6202-73119.)

(23) Power analysis and summary of feeders. (Standard form for A. C., plan, BuShips No. 9-S-5560-L. See also page 14, line 34.)

(24) List of D. C. feeders and mains of ship's service and emergency systems. (Standard form, plan, BuShips No. 9-S-4746-L.)

(25) Complete list of transformers with load data. (Standard form, plan, BuShips No. 9000-S6202-73119.)

(26) Summary list of all storage batteries on vessel. Showing charging arrangements. (Standard form, plan, BuShips No. 9000-S6204-73113.)

(27) List showing switch arrangements, loads, fusing and other features of distribution panels. (See also page 14, line 37.) Each panel shall be identified by a number assigned by the shipbuilder for the purpose of ordering and shipping. This number shall remain unchanged through the development of design details of the equipment and its final location in the vessel and shall not affect the panel designation required by section S28-2. Each panel shall be tagged by the

manufacturer with this number for ready identification at the time of actual installation aboard the vessel. (Standard form, plan, BuShips No. 9000-S6201-73444.)

- 5 (b) *Lighting system.*—Plans within any of the type groups such as elementary or isometric diagrams grouped below shall normally be furnished as individual plans. In all cases, details of the power supply such as transformers and other related equipment shall be shown up to the basic power consuming equipment.

- 10 (1) Elementary wiring diagrams of running, anchor, and signal lights.
 (2) Elementary diagram of control of all night flight lighting systems.
 15 (3) Elementary diagram of control of hangar deck lighting.
 (4) Isometric wiring diagram of ship's service system.
 20 (5) Isometric wiring diagram of emergency system.
 (6) Isometric diagram of circuits of all night flight lighting systems.
 25 (7) Isometric wiring diagram of running, anchor, and signal lights.
 (8) Isometric wiring diagram of lighting circuits in hangar decks and mounts and in other mounts.
 (9) Working wiring deck plans.
 (10) Outline plan of vessel showing exact locations of all searchlights, running, anchor, and signal lights.
 30 (11) Plan showing locations of all night flight lighting systems.
 (12) List of feeders and mains of lighting systems. (Standard form, plan, BuShips No. 9-S-5474-L.)
 35 (13) Load, analysis and summary of feeders. (Standard form, for A. C. plan, BuShips No. 9-S-5650-L. See also page 13, line 114.)
 (14) List showing switch arrangements, loads, fusing and other features of distribution panels. (See also page 13, line 125.)
 40 (15) *Illumination survey data.*—(Standard form, plan, BuShips No. 9-S-4901-L.)
 (16) Deck plan showing the location arrangement of light traps, door switches and red lights, including necessary painting or shielding of globes.
 45 These plans shall also show the location arrangements of the luminous (radium activated) markers.
 (17) List of lighting fixtures and appliances with symbols and summary of lighting system equipment. (Standard form, plan, BuShips No. 9-S-4905-L.)

50 (c) *Searchlight installation.*—

- (1) Elementary and isometric wiring diagrams of searchlight installations shall be incorporated in the applicable elementary and isometric wiring diagrams of the power, lighting, interior-communication and fire-control systems from which they are energized and controlled.
 55 (2) Plan showing coverage and interferences in plan and elevation of all searchlights installed on the vessel.
 60 (3) The location of searchlights shall be shown on the outline plan of the vessel showing exact location of all searchlights, running, anchor, and signal lights. (See line 28 above.)
 65 (4) Such other installation plans as required for platforms, stanchions, etc.

(d) *Interior-communication and fire-control systems.*—

- (1) Elementary wiring diagram of each interior-communication and fire-control system. The Government will supply to the shipbuilder plans of elementary wiring diagrams of self-synchronous fire-control circuits which are energized via a fire-control switchboard when furnished by the Government, to be used as the basis for preparation of the ship installation wiring diagram(s). 70
 (2) Diagram of current supply to interior-communication switchboards and panels. 75
 (3) List and isometric diagram of voice-tube outlets.
 (4) List of telephones (sound powered and automatic). The plans showing the lists of sound-powered telephones shall also indicate the assignment of telephone headsets, handsets, blast helmets, and E calls for each station. The lists on these plans shall be so arranged that the plans may be cut up into approximately 8- by 10½-inch sheets to form a booklet, the plan title becoming the first page. 80
 85 (5) Sound-powered telephone switchboards and panels. (See par. S1-1-j.)
 (6) List of announcing reproducers, transmitter stations, control boxes, and intercommunicating units. 90
 (7) Isometric wiring diagram of each interior-communication and fire-control system. Separate isometric wiring diagrams shall be submitted covering switchboard type battle telephone circuits, switch-box type battle telephone circuits, string type battle telephone circuits and automatic telephone circuits. All intercommunicating type announcing systems may be shown on a single isometric wiring diagram. 95
 100 (8) Load summary of all circuits emanating from interior-communication switchboards and panels (standard form, plan BuShips No. 9-S-5112-L). This plan shall also include information as to rating of power supply equipment (e. g. motor generator, transformer) for each switchboard and panel. 105
 This plan shall be submitted prior to submission of plans of the I. C. switchboards and panels.
 (9) Interior communication and action cut-out switchboards and panels. (See par. S1-1-j.) 110
 (10) Deck plans (¼-inch scale on surface ships, ⅜-inch scale preferred on submarines although larger scale shall be used if necessary for clarity); separate sets of plans for interior-communication and fire-control systems. Corrected plans of interior-communication and fire-control deck plans will not be required but tracings of the finally approved working deck plans shall be submitted in the same manner and in the same number for distribution as required for corrected plans of other items. 115
 Submission of such tracings for approval will not be required. 120
 (11) Summary of interior-communication and fire-control equipment. (Standard form, plan BuShips No. 9-S-5113-L.) 125
 (12) Plans showing in detail the mounting arrangements in the ship of:
 (a) Transmitters for propeller revolution indicator system.
 (b) Underwater log rod meters and transmitters. This plan shall also include the relative 130

location of other equipment, such as underwater sound projectors, which may cause interferences or turbulence at the underwater log meters.

(c) Transmitters for rudder angle and bow and stern plane angle indicator systems.

(13) Interior communication schematic wiring diagram: This plan shall contain one-line diagrams of systems requiring action cut-out switches, and shall be submitted prior to submission of elementary and isometric wiring diagrams.

(e) General plans for all miscellaneous electrical systems and installations in the following spaces (these plans are in addition to those submitted as purely general arrangement plans for joint approval of the bureau concerned). Wireway plans shall be developed in collaboration with the development of the machinery arrangement (and prior to fixing such arrangement), so as to insure compliance with all cable arrangement (including circuit trunking) and installation specification requirements, allotment of space, etc.

(1) Wireways.—

(a) Master wireway (small scale) plan, showing all wireway locations (all decks and in profile); with master reference plan table for listing each wireway deck and detail plan subsequently developed.

(b) Wireway deck plans.—Composite for all systems—power, lighting, I. C., F. C., electronic, steering gear Selsyn, etc., including thereon the following minimum information:

Location of runs.

Approximate space dimensions of runs.

Designation of methods of support used for each section of runs.

Designation of sections (and plan numbers for same) for which wireway details are shown on separate plans.

Cables in the runs—showing for each:

Circuit number.

Cable type and size.

(c) Wireway details.—As necessary, including the following minimum information:

Arrangement (vertical) of cables in main wireway racks.

Arrangement in gun director tower.

Arrangement of gun mounts.

Arrangement in all armored trunks and wiring tunnels.

Arrangements at important locations, such as engine and fireroom bulkheads, vicinity of main switchboards and I. C. and F. C. switchboards.

(2) Dynamo flats.—Diesel engine generator rooms—switchboard rooms (to show arrangements of generator sets, rheostats, voltage regulator units, and switchboards).

(3) Storage battery compartment and arrangement of battery-charging station.

(4) Arrangement of electrical workshop.

(5) Steering gear room.

(6) Turrets and mounts.

(7) Turret.

(a) Column and base.

(b) Castings.

(8) Torpedo tubes.

(9) Torpedo rooms.

(10) Refrigerating plant spaces.

(11) Machinery spaces.

(12) Fire rooms.

(13) Motor rooms.

(14) Bridge.

(15) Central station.

(16) Chart house.

(17) Conning tower.

(18) Armored access and wiring tubes.

(19) Control rooms.

(20) Maneuvering rooms.

(21) Fire-control and director stations.

(22) Gyro rooms.

(23) Interior-communication room.

(24) Cable installations at exposed guns and directors.

(25) Masts.

(26) Pilot house.

(27) Plotting rooms.

(28) Ship's service telephone exchange.

(29) Photographic laboratory.

(30) Flight deck amplifier room.

(31) In general, radar control and transmitter rooms, all ship control, fire control, flag control, and operation control spaces such as open bridge, air defense stations, combat information centers, joint operation and war command rooms.

(f) Miscellaneous.—

(1) Schedule of working plans of electrical installation.—Tabulation of both shipbuilders' and manufacturers' plans listing in parallel columns (a) Titles; (b) shipbuilder's or contractor's plan numbers (with column for alteration numbers); (c) BuShips plan numbers (with column for alteration numbers); (d) estimated date of submission for approval and (e) remarks. Additional columns may be added to suit the shipbuilder's convenience.

(2) Plans listing all methods of supporting cables, fixtures, panels, appliances, and related equipment, by Bureau plan, alteration and method numbers as used; and delineating any proposed methods which are departures from the Bureau standard methods. Also plans shall be furnished of any nonstandard (special) fixtures and appliances used.

(3) Diagrammatic wiring plans of power and lighting systems and diagram of connections of generator and distribution switchboard required for proper care and operation of the electrical plant, reduced to a size that is legible, can conveniently be handled, and mounted on sheet metal or other suitable rigid material and covered with a transparent sheet. These plans shall be uniform in size and mounted in a suitable case so that they can be hinged or slipped out for inspection. The individual sheets shall not be removable.

(4) List of electrical weights showing shipbuilders' or contractors' plan numbers, Bureau plan numbers, quantity, unit weights, and total weights, in pounds, of all electrical material installed, whether furnished by the shipbuilder, contractor or Bureau. (Bureau standard form, plan BuShips No. 9-S-3617-L. See also par. SI-1-e.)

(5) Plans showing dimensioned location of all wiring appliances which require access for inspection and repair, concealed by sheathing, false decks or floors.

(g) All electrical apparatus and equipments.—(Refer to detail requirements of applicable sections of General

Specifications for Machinery, Bureau of Ships (JNT specifications and Navy Department Specifications).

- Electronic plans.—The following working and corrected plan of the electronic equipment installation in vessels shall be furnished by the shipbuilder. Working plans of electronic equipment should be submitted for approval separate from all other plans and in any order desired. All plans required hereunder shall be indexed in accordance with paragraph S1-1-q.

10 (a) **Wiring.**—

- (1) Elementary wiring diagram of each electronic system in electronic equipment group. (A separate plan for each electronic equipment circuit installed in vessel, except radio communication system and sonar system circuits or where different circuits are closely interconnected and related to each other functionally such as a radar and associated IFF circuit in which case a single plan is satisfactory.)

- (2) Isometric wiring diagram of each electronic system circuit is electronic equipment group. One isometric plan for each elementary wiring diagram.

- (3) Deck plans ($\frac{1}{4}$ -inch scale on surface ships, $\frac{1}{8}$ -inch scale on submarines), separate sets of plans for complete electronic system installations (includes radio, radar, sonar, IFF, countermeasures, beacons, etc.).

- (4) Electronic system schematic wiring diagram—This plan shall contain one line diagram of power supply feeds to various units indicating all motor generators, line and regulating transformers and different loading, cut-outs and switching. This plan shall be submitted prior to submission of elementary and isometric wiring diagrams.

35 (b) **Arrangements.**—

- (1) General arrangement of each electronic space in vessel (including radio central, radio and radar transmitter rooms, emergency radio station, radar and sonar control rooms, sonar sea chests and hull fitting, IFF, countermeasures, direction finder and beacon stations, motor-generator rooms, etc., where applicable).

- (2) General arrangement of all topside electronic antenna systems (including radio transmitting and receiving antennas, rod, whip, and special types). Radar antennas, air, surface, and fire control types, IFF, countermeasures, beacon and D/F antennas.

- (3) General arrangement of antenna trunks, transmission lines, lead-in.

50 (c) **Miscellaneous.**—

- (1) Detailed plans for all electronic equipment or special material furnished by the shipbuilder or contractor. (Detailed plans of Government-Furnished electronic equipment are not required to be furnished by the shipbuilder.)

- (2) List of all items of equipment comprising the complete electronic installation.

S1-1-m. **Sizes and material for plans**

- Sizes of plans, arrangement of title block, etc., shall be in accordance with plan, BuShips No. S0103-655774, copy appended to this section, except that plans of interior-communication and fire-control systems, equipment, and switchboards shall not exceed 80 inches in length.

- Tracing cloth used in the preparation of hand tracings shall be in accordance with Federal Specification CCC-C-531, unless otherwise approved.

Photographic tracings shall be furnished on tracing cloth

in accordance with Federal Specifications DDD-C-471, type I, class B, unless otherwise specified. White cloth vellum is not acceptable. Photographic tracings shall be right reading and capable of producing a clear and distinct print, and there shall be no distortion nor illegibility of the lines or figured dimensions.

For photographic tracings to be microfilmed, see paragraph S1-1-o.

S1-1-n. **Ship's plan index**

Ship's plan indexes in accordance with forms supplied by the Bureau shall be furnished by the shipbuilder or contractor as noted below. For brevity, the ships' plan index will hereinafter be referred to as "SPI."

- (a) For vessels having an over-all length of less than 200 feet, a single SPI shall be prepared to cover all vessels of the same design class built by the same contractor.

- (b) For vessels having an over-all length of 200 feet, or more, a single SPI shall be prepared for each vessel.

Except as otherwise specified herein, the SPI shall list all plans under the cognizance of this Bureau which apply to the vessel concerned, including plans of Government-furnished equipment.

- (a) Plans of items of equipment which are listed in a plan list of plans covering all plans applicable to any item of equipment, are not to be listed in the SPI. In such cases, it will be necessary to include only the plan list of plans in the SPI. The above procedure also applies to miscellaneous items such as lighting fixtures and appliances, interior communication equipment, etc., where such items are covered by ship's plans listing the various items by Bureau plan numbers, e. g., plan, BuShips No. 9-S-4905-L, standard forms for listing and summarizing lighting system equipment, and plan, BuShips No. 9-S-5113-L, List of Interior Communication Equipment.

- (b) Standard or commonly used items which are covered by Bureau standard or general type plans such as valves and pipe fittings, airports and lockers, need not be included in the SPI provided such items are listed by Bureau plan number on ships' plans covering the systems, spaces or equipment concerned.

The SPI shall show the title and the Bureau plan number as well as the shipbuilder's or contractor's plan number of each plan applicable to the vessel concerned. The SPI shall include the title and key or suffix of each plan as well as the Bureau plan number.

The SPI shall include all plans, hull (see General Specifications for Building Vessels of the U. S. Navy, Appendix 16), machinery, electrical, and electronic, grouped under the applicable filing manual "S" classification. The SPI shall be prepared on reproducible paper forms. Copies of these forms will be supplied by the Bureau upon receipt of requests specifying the number of fly pages and the number of index pages of each type desired.

Where plans for a class of vessels are being produced by a design agent or leading shipbuilder, the original of the SPI shall be prepared by that activity and a reproducible copy of same shall be made for each vessel, or group of vessels, depending on the over-all length of the vessels concerned. Each SPI shall be titled to show the vessel to which it is applicable. The reproducible copies shall be made on transparent reproduction paper similar to that known as "Photac" paper made by Keuffel and Esser Co. or "Copyflex" paper made by the Charles Bruning Co. Reproducible copies of SPI furnished to

following shipbuilders shall have the plan alteration number deleted as these shall be inserted in the shipbuilder to suit the vessel concerned.

- Each shipbuilder shall correct his SPI copy to show the correct list of applicable plans at the time of delivery of the vessel concerned. Two copies of the SPI shall be furnished each vessel at the time of delivery of the vessel concerned. The reproducible copy of the applicable SPI shall be forwarded to the navy yard designated as the fitting-out activity. If an activity other than a navy yard is designated as the fitting-out activity the reproducible SPI shall be forwarded to the vessel's home yard and a copy of the fitting-out letter shall be furnished to the Bureau. At the same time, vandyke prints and blueprints of the SPI shall be forwarded to the activities listed below in this section.

- Regarding important alterations accomplished after delivery of a vessel the fitting-out activity or home yard shall modify the SPI as necessary to record all important alterations. The term "important alterations" as used herein, shall be interpreted as including all alterations which affect the plan's usefulness in making repairs or replacements. Since the tracings of ship's plans produced by building yards or design agents are not available for distribution until some months after delivery of a vessel, the procedure for making these alterations outlined below shall be followed:

- (a) Except as noted below in lines 98 to 103, the activity accomplishing the alterations shall prepare plans as necessary to show that part of the installation which was altered. In case the alterations are extensive, a complete new plan shall be prepared to supersede the original plan insofar as the altered vessel is concerned. Each such plan shall be assigned a new Bureau plan number and each such plan should contain a note giving the Bureau and the shipbuilder's plan number and title of the original plan affected by the alterations concerned. The tracing of each plan covering important alterations should be forwarded to the Bureau immediately upon completion of such alterations. At the time of completion of the overhaul or availability of the vessel concerned a copy of the plans showing the alterations shall be furnished to the vessel concerned. If the reproducible of the SPI is on file at the activity accomplishing the alterations, that activity shall modify same as required and furnish the vessel with two prints of each revised page thereof. If the reproducible of the SPI has been prepared but is not on file at the activity accomplishing the alteration, a copy of the plans showing the alterations shall also be forwarded to the home yard of the vessel concerned with the request that the reproducible of the SPI be modified to include the alterations.

- (b) The reproducible copy of the SPI will be filed at the home yard of the vessel concerned after being corrected by the fitting out navy yard. Upon receipt of copies of plans showing alterations as referred to above, the reproducible of the SPI should be corrected by adding the plans showing the alterations under the proper filing manual group and by entering the Bureau plan numbers of same opposite the original plan and under the column headed "For alterations see BuShips plan No." In case the alterations are so extensive as to require a new plan, the SPI shall be modified by fitting out the original plan numbers and recording the new plan as outlined above.

- (c) After the SPI has been corrected to cover alterations accomplished during the availability of the vessel, revised prints of the altered SPI pages shall be distributed as follows:

- (1) One vandyke print of each sheet to—
 - Bureau of Ships.
 - Commandant of each navy yard except Washington, D. C., and Mare Island.
 - Commandant Navy Yard, Mare Island, for all vessels except battleships (BB), aircraft carriers (CV) and aircraft carriers (large) (CVB) and aircraft carriers (small) (CVL).
 - Officer-in-Charge, U. S. Naval Drydock, Hunter's Point, San Francisco, Calif.
 - Commanding Officer, U. S. Naval Drydock, Roosevelt Base, Terminal Island (San Pedro), Calif.
 - Commanding Officer, Industrial Command, U. S. Naval Repair Base, San Diego, Calif.
 - Fitting-out activity.

- (2) Two blueprints to the vessel and one blueprint copy to each other activities as may be designated by the Bureau.

(d) In case any page of the SPI does not have sufficient space for adding new plans under the filing manual group or subgroup covered by that page, new pages may be added. The new pages shall retain the same page number as the original page, but in addition shall have alphabetical suffixes, e. g., page "42A," "42B," etc.

In those cases where important alterations are accomplished by the yard which built the vessel concerned, and where the tracings of the vessel's plans are still available at that yard, the original tracings shall be modified by that yard wherever practicable, rather than preparing new plans to cover such alterations.

Where the SPI is prepared to cover a group of vessels having an overall length of less than 200 feet, the activity preparing the SPI shall be informed, via the supervisor concerned, of the title and Bureau plan number of any plan prepared by other activities which involve important alterations in plans listed on the SPI. The activity preparing the SPI shall keep same corrected to include plans showing important alterations. Upon completion of the first vessel covered by the SPI, vandykes and blueprints of same shall be distributed as specified above lines 71 to 91. As corrections or additions to the SPI are made, vandykes and blueprints showing revisions shall also be distributed as specified in above lines 71 to 91. Upon completion of each group of vessels covered by the SPI the reproducible of same shall be forwarded to the Bureau via the cognizant Supervisor of Shipbuilding. Thereafter, activities preparing new plans covering important alterations on the vessels concerned, shall advise the Bureau of changes necessary in the SPI. When plans of any design class are being produced by a design agent or leading shipbuilder, the original SPI shall be prepared by that activity and distributed as specified above, lines 6 to 17. The individual shipbuilders shall then file same to show the vessels covered thereon, and keep same corrected as necessary to show all plans and the vessels to which they apply.

SI-1-o. Microfilm

Upon completion of the first vessel in any one design class, the shipbuilder concerned shall make arrangements with the Bureau for the microfilming of tracings of all

Distribution of copies of SPI shall be as specified in Bureau spec.

plans applicable to that vessel at the shipbuilder's plant at least 6 weeks prior to completion of the vessel. Where plans for a class of vessels concerned are prepared by a design agent or leading shipbuilder and furnished to other shipbuilders (following shipbuilders) for building other vessels of the class, the arrangements for micro-filming tracings specified above should be made by the design agent or leading shipbuilder.

To insure that satisfactory microfilm can be prepared from plans, the size of the letters and figures on such plans shall be not less than $\frac{3}{32}$ inch high with a spacing between lines of not less than $\frac{1}{16}$ inch and the letters and words shall be sufficiently spaced to prevent crowding or blurring on the microfilm.

Corrected plans prepared by photographically reducing shop drawings to Bureau standard size tracings, will not be acceptable if the drawing is distorted or the lettering and the views blurred. Care shall be taken that all letters, figures and lines on photographic tracings are clear and sharp, so as to make all details legible. Special attention shall be paid to tolerance dimensions.

S1-1-p. Booklet plans of machinery

General requirements.—(a) In general for all major combatant ships and for all vessels having an overall length of 250 feet or more a separate booklet plan of machinery shall be prepared for each vessel by the shipbuilder.

(b) In general, for vessels having an overall length of less than 250 feet, a single booklet plan of machinery shall be prepared by the shipbuilder to cover all vessels of the same design class, being built at that yard.

Preparation.—(a) A separate pen-and-ink tracing, or photographic reproduction in accordance with paragraph S1-1-m herein, composed of all the individual plans comprising the booklet shall be prepared for each vessel delivered, titled to show the identification number of the vessel. The tracing shall not be cut up into the several individual plans comprising the booklet, but shall be retained in sheets of reasonable length to provide convenience in handling, forwarding, and printing. The composite pen-and-ink tracing or photographic reproduction shall be assigned a separate Bureau plan number for which the tracing is made applicable; individual plans shall show in lower right-hand corner, inside the border-line, the assigned Bureau number followed by sheet Nos. 1, 2, 3, etc., in proper sequence. The composite tracing or a photographic reproduction thereof shall be furnished the fitting-out activity at the time of delivery of the vessel and will be completed at such a time that the vandykes and prints as required hereinafter will have been obtained prior to delivery of the vessel to the fitting-out activity.

(b) In the case of a class of vessels being built at a yard, a pen-and-ink tracing shall be prepared and titled for the first vessel of the class. In the event of design changes on subsequent vessels a reproducible reproduction or the equivalent of the original tracing will be adapted to the following vessels of the class being constructed at the shipbuilder's yard, by modifying the reproduction to agree with the vessel for which it is intended and the assignment of a separate Bureau of Ships plan number. Where major differences between vessels exist, it may be found advisable to prepare a new pen-and-ink tracing.

(c) In the case of a shipbuilder or navy yard being furnished plans by a basic contractor for vessels being built at yards other than the lead yard, a reproducible

reproduction of the initial tracing of the booklet shall be furnished by the lead yard. The shipbuilder or navy yard will adapt the reproduction to vessels under construction at this yard by modifying the reproduction to agree with the vessel for which it is intended and by assigning a separate Bureau plan number. Where major differences between vessels built at different yards exist, the respective yards shall prepare new pen-and-ink tracings for their respective vessels.

Before preparation of the final tracings, the plans for the Booklet Plans of Machinery shall be submitted for the approval of the Bureau. The individual plans comprising the booklet and included on the composite tracing shall be 14 by 34 inches with a $\frac{1}{2}$ -inch margin all around, except on the left edge where a margin of $1\frac{1}{2}$ inches shall be left for binding when the booklet is assembled. No more than one system shall be shown on an individual plan, and each system shall be complete. All valves, branches, and connections to main and auxiliary machinery and equipment shall be shown.

Plans shall show leads of all piping connections in skeleton diagrammatic arrangement. Copies of Bureau standard plans may be requested as indicative of what is required. (See type plan, BuShips No. 6-Y-374). At least one tracing showing in plan, each of the following systems and connections as installed and one showing in elevation each as installed shall be furnished. Certain systems may be shown for each deck if desirable.

For all vessels, except submarines:

- (a) Main and auxiliary steam piping.
- (b) Boiler feed; suction, discharge, and make-up feed piping.
- (c) Auxiliary exhaust steam piping.
- (d) Fresh water tanks; filling and suction piping.
- (e) Fire and bilge; suction and discharge piping.
- (f) Distilling plant; all piping.
- (g) Refrigerating plant, refrigerant, brine, and water piping.
- (h) Steam heating plant, steam and drain piping.
- (i) Low-pressure steam drainage; piping and traps.
- (j) High-pressure steam drainage; piping and traps.
- (k) Main turbine glands; steam supply, leak off piping, and steam leakage recovery system.
- (l) Main propelling machinery; lubricating oil supply return and purification system.
- (m) Lubricating oil tanks; filling and suction piping.
- (n) Sea valves; suction and discharge connections.
- (o) Salt water service in machinery spaces.
- (p) Compressed air; deck and machinery supply system.
- (q) Fuel oil; tank filling transfer and tank drain piping.
- (r) Fuel oil, tank heating system, complete.
- (s) Fuel oil; burner supply piping to boilers, galley incinerator and other special services.
- (t) Electric cable, electric propulsion arrangement, generators via control station to motors, excitation and control systems.
- (u) Remote operating equipment for vital valves for control of damage.
- (v) Steering gear, remote control system.
- (w) Such other additional systems as the Bureau may specify in the individual case.

NOTE.—For destroyers and smaller types of vessels where any of the above enumerated systems are not extensive, two or more can be combined and shown on the same sheet if convenient.

For heavy-oil engine installations including submarines, items (d), (f), (g), (h), (m), (n), (q), (s) and (t) shall be furnished as given in the foregoing subparagraph and the following additional items:

- 5 (a) Forced lubrication and piston supply, and purification system.
- (b) Compressed air; scavenging, supercharging, and starting system.
- (c) Compressed air; ship's high-pressure system.
- 10 (d) Compressed air; ship's low-pressure system.
- (e) Automatic fuel compensating system.
- (f) Main and auxiliary water systems.

In addition to the foregoing plans, general data for all vessels shall be supplied, prepared on a similar tracing, including a general synopsis of the official contract trials. The latter will be furnished to the shipbuilder by the Bureau, via the Supervisor of Shipbuilding. The general data required shall include the following items, covering dimensions and outstanding characteristics:

- 20 (a) Hull.
- (b) Propelling machinery.
- (c) Shafting and bearings.
- (d) Propellers.
- (e) Boilers.
- 25 (f) Pumps.
- (g) Auxiliary machinery.
- (h) Condensers and vacuum equipment.
- (i) Lubricating oil capacity and storage.
- (j) Fuel capacity and storage.
- 30 (k) Fresh water capacity and storage.
- (l) Speeds and performance characteristics on official trials.
- (m) Heat balance flow diagrams as specified.

Distribution.—Three preliminary copies of booklet plans shall be furnished to the prospective commanding officer immediately upon his assignment to the vessel in the precommissioning period.

Upon delivery of each vessel the shipbuilder shall furnish the Bureau vandyke prints and two bound copies of the Booklet Plans of Machinery applicable to the vessel concerned and in addition shall distribute bound copies (blue-line prints) of same as follows:

- 40 (a) Ten to the commanding officer of each vessel for battleships, carriers, all cruisers and five to destroyers and all other vessels.
- 45 (b) One to each navy yard, less Washington D. C., and the outfitting activity.
- (c) One to U. S. Naval Drydocks, Hunters Point, San Francisco, Calif.
- 50 (d) One to U. S. Naval Drydocks, Terminal Island (San Pedro), Calif.
- (e) One to Industrial Command, U. S. Naval Repair Base, San Diego, Calif.
- (f) One to Commandant, Naval Operating Base, attention of Industrial Department, Navy No. 926.
- 55 (g) One to the Superintendent, U. S. Naval Academy.

All bound copies shall be placed in a cover or binder of black fabricoid material approximately 13 by 15 inches in size, of a type utilizing metal binding posts to permit ready replacement of revised plans. The title "Booklet Plans of Machinery" shall be printed on the cover; the official designation number of the vessel shall be printed on the cover and also on the binding edge. The printing shall be in gold leaf.

65 Where Booklet Plans of Machinery are titled as applicable to only one vessel, the cloth tracings of same shall be sent to the outfitting activity for recording

alterations covering work performed by that activity and for ultimate transmission of the tracings to the home yard of the vessel concerned. In event of major changes by the outfitting activity distribution as specified in (d) above shall be superseded with new plans, with instructions to destroy superseded copies of same.

Where Booklet Plans of Machinery are titled as applicable to more than one vessel, the procedure in (e) above shall be followed except that vandyke prints shall be sent to outfitting activities and home yards and cloth tracings to the Bureau for file.

S1-1-q. Numbering and altering of plans

Numbering.—Working plans furnished for the machinery installation, electrical plant and electronic equipment installation shall be assigned Bureau plan numbers by the shipbuilder prior to distribution. This number shall consist of the following three parts (except where otherwise noted herein):

(.) The first block shall contain the official designation of the lowest numbered vessel of the class to which the plan applies at the time the plan is numbered. The vessel identification number which is inserted in the first block by a lead yard or design agent shall be retained even though the plan may be later altered by a following yard so that it is no longer entirely applicable to the lowest numbered vessel of the design class to which it originally applied. The first block number shall also be retained in those cases where the plan is later made applicable to a lower numbered vessel of the same design class. However, new plans prepared by following shipbuilders and others shall be assigned the vessel identification number corresponding to the lowest numbered vessel to which the plan is applicable. In those cases where the final assignment of different items of machinery and equipment to vessels of the same class is unknown when plans are prepared, it will be satisfactory to insert in the first block the identification number of the lowest numbered vessel of the class.

(b) The second block shall contain the letter "S" followed by the four digits of the design class, as shown in the Navy Filing Manual in accordance with the functional application. At end of line 110, add: "Four digits should always be used in numbering plans. The first two digits represent the main category."

Examples:

Item	Bureau of Ships Supplement Navy Filing Manual
Docking plan	S7
Outside plating	S11/1
Midship section	S11/11
Lubricating oil system	S45
Main steam piping	S48/10
Machinery arrangement	S40

Except in the case of small boats, S82 group, sub-subcategory in numbering plans.

Examples:

Item	Bureau of Ships Supplement Navy Filing Manual
Gyrocompass	S24/7-1
Magnetic compass (direct reading)	S24/7-2
Magnetic compass (remote indicating)	S24/7-3
Range (commissary equipment)	S34/2-1

paragraphs (b) and (c) only, since such plans are usually developed prior to information on the specific vessel identification number. This type of plan is intended for use by various installation and design activities who shall follow the procedure specified below.

Preconversion plans of Maritime Commission vessels shall be assigned Bureau plan numbers in accordance with instructions furnished by the Bureau.

Plans involving machinery for small boats shall be assigned Bureau plan numbers in accordance with instructions to be furnished by the Bureau. Small boats are craft generally under 70 feet in length which are assigned hull registry numbers (of the Form C-0000 when privately built, or 0000 when navy yard built), which do not appear in the Ships Data Book, are not formally commissioned and are not specifically assigned a commanding officer by the Bureau of Naval Personnel.

Alterations.—Where plans prepared by one design navy yard or shipbuilding contractor (design agent) are used by other navy yards or shipbuilders for the construction of duplicate ships, the Bureau desires insofar as practicable, and unless otherwise specified, that no changes be made to the basic plans by the following navy yards or shipbuilders. Only such changes as are clearly necessary to meet local conditions should normally be made by following shipbuilders. The Bureau expects that the number of such changes will be kept to a minimum by all activities. Alterations of plans shall, in all cases, clearly identify the vessels to which the modified plans are applicable.

Should the experience of a following yard indicate the necessity of a major change to basic plans, such yard will forward to the design agent via the cognizant Supervisor of Shipbuilding its recommendation for such change.

To distinguish plans furnished by the following yards from those furnished by other following yards or from the lead yard or design agent, the procedure outlined below shall be followed by all shipbuilding and design agencies.

(a) The original submission of any working machinery plan by a design navy yard or shipbuilding contractor (design agent) shall be marked "Alt 0." Subsequent submissions of the same plan with modifications which are applicable to all ships of the class shall be marked "Alt 1," "Alt 2," etc. The alteration column in the body of the plan referred to in paragraph S1-1-h shall be marked 1, 2, 3, etc.

(b) The following navy yard or shipbuilder who receives working plans from a design navy yard or shipbuilding contractor (design agent) shall ~~lead shipbuilder or design agents' alteration number~~ after this shall enter a dash followed by a key letter(s) to indicate the name of the following shipbuilder concerned. Key letter(s) for this purpose, will be assigned all activities by the Bureau and shall be added to the plan number regardless of whether the plan received from the lead yard or design agent has been altered by the following shipbuilder. If the plan has been altered by the following shipbuilder, the numerals 1, 2, 3, etc., should follow the key letter, both in the alteration column and in the body of the plan. If the plan has not been altered by the following shipbuilder, the numeral "0" should not be used because of possible confusion between the figure "0" and the letter "O." Examples:

(1) Plan received from lead yard or design agent may be numbered DD445-S4800-6623, Alt. 3.

(2) If the above plan is not altered by following shipbuilder, the number would be DD445-S4800-6623, Alt. 3-B.

(3) If above plan is altered by the following shipbuilder, the number would be DD445-S4800-6623, Alt. 3-B.

NOTE.—The key letter B above is assigned to the Boston Navy Yard.

(c) A design navy yard or shipbuilding contractor (design agent) modifying a working machinery plan for his own purposes only, such modifications not being applicable to ships built by following navy yards, or shipbuilders, shall also, on the modified plan, insert a consecutive number and the key letter(s) of the design navy yard or shipbuilding contractor in accordance with the preceding paragraph (b) herein.

(d) Where a design navy yard or shipbuilding contractor's (design agent's) plans are furnished to one navy yard, which is acting as the leading yard in the procurement of materials and the distribution of plans to be used in the construction of a class of vessels building at more than one navy yard, the leading navy yard shall follow the procedure for numbering outlined above. If the same plans are further altered by one of the other navy yards concerned, the alteration number and key letter of the yard concerned shall be substituted for that of the leading navy yard. The Bureau desires that not more than two sets of alteration numbers appear on the same plan.

(e) When, for any reason, it becomes necessary for a following navy yard or shipbuilder to redraw a working machinery plan, this redrawn plan shall be assigned a new Bureau of Ships number from a block of numbers assigned to the local supervisor or navy yard by the Bureau. This shall be followed by alteration numbers 0, 1, 2, etc., and the key letter(s) of the yard or shipbuilding contractor redrawing the plan. The title block shall show only those vessels to which the plan is applicable. The redrawn plan shall also bear the following note:

This plan supersedes (plan number) for (list vessels for which redrawn plan applies).

(f) Blueprints of working plans altered by following navy yards or shipbuilders and showing only minor alterations which are approved by the local supervisors are not desired by the Bureau for its files. Only when alterations involve features of design or when the local supervisor considers that an alteration is of sufficient importance to warrant Bureau cognizance should plans delineating these alterations be forwarded to the Bureau except in the case of diagrammatic plans, in which case copies of all alterations shall be forwarded to the Bureau. Copies of all working plans prepared by the design navy yard or shipbuilding contractor (design agent), alterations thereto, and of new plans prepared in accordance with subparagraph (e) above, shall be forwarded to the Bureau's files unless otherwise specified and shall be forwarded as soon as practicable.

S1-1-r. Forwarding procedure

Blueprints.—All blueprints to be furnished the Bureau shall be folded accordion style so that the title block and Bureau plan number are visible when folded. The folded dimensions should be such as to permit filing the plans in cap size drawers. See attached figure 1 for method of folding.

Reproducible plans.—Tracings, vandykes, and plans

shall be followed by alt. 0, 1, 2, 3 etc., and need not be assigned the key letter(s) of the yard or shipbuilder/contractor

remain
DD445-S4800
6623, Alt. 3.

must be followed by Machinery,
the

and shall be packaged in such a manner as to prevent damage in shipment.

from which reproductions are to be made shall be shipped in roll form. Plans shall be rolled from left to right so that the title will appear first when unrolling. Each set shall be wrapped in a waterproof wrapper and be packed separately, ready for shipment, in strong, wooden cases in which the rolls shall be so secured that it will be impossible for them to be displaced or crumpled in transit.

Prior to assembling the above set of tracings the Bureau shall be requested to furnish shipping instructions and instructions as to the method of assembling and marking these tracings. When plans are forwarded under separate cover a copy of the letter or mailing order shall be enclosed with the plans, but such copy shall be stamped "For identification only."

Correspondence.—The procedure outlined below should be followed as far as practicable when plans are forwarded to the Bureau.

(a) The correspondence or mailing order forwarding the plans should list each plan forwarded, by Bureau plan number and title.

(b) Correspondence forwarding plans requiring Bureau action should be separate from that forwarding plans for information and file only.

(c) Correspondence forwarding plans should clearly indicate whether the plans are forwarded for Bureau action or for information and file. This shall be indicated in the first paragraph of the forwarding letter or by a conspicuous rubber stamp at the top of the letter reading "Bureau action required" or "Forwarded for information only." The above is intended to prohibit the indiscriminate lumping together of unrelated plans which happen to be ready for forwarding on the same date.

(d) Where feasible, a large number of plans for approval shall be forwarded to the Bureau in sets including plans grouped under subjects such as machinery and piping arrangements, turbines and gears, internal combustion engines, and other related groups, with each set forwarded under separate correspondence.

S1-1-s. Inspection and performance acceptance tests

Unless otherwise specified, the inspections and tests made in accordance with the requirements of the applicable specifications shall be recorded in a complete test report as hereinafter stated. These reports may be made on shipbuilder's or contractor's test forms, except when Stand-

21

where a large number of plans are involved in one shipment, each

S1-1-s

ard Forms, (see Appendix 1) have been prepared by the Bureau.

The inspections and tests which may be required by the applicable specifications and which shall form the basis of test reports are as follows:

(a) Separate tests of driving or driven units.

(b) Combined assembly tests of driving and driven units. All combined assembly performance acceptance tests shall include all data required by applicable material specifications as follows:

(a) Test report of driving unit. For alternating-current motors refer to *N.B. Spec. 4764*. For direct-current motors refer to *N.B. Spec. 7417* and Factory Test Record, Form I. N. M. 21.

(b) Test record of controller (if involved). For alternating current controllers, refer to *N.B. Spec. 4764*. For direct current controllers, refer to *N.B. Spec. 7417* and Factory Record, Form I. N. M. 23.

(c) Test record of generators (if involved). For alternating-current generators, refer to *N.B. Spec. 7417* and Factory Record, Form I. N. M. 36. For direct-current generators refer to *N.B. Spec. 7417* and Factory Record Form I. N. M. 22.

(d) Test record of driven unit, including copies of all recorded test data and characteristic curves plotted therefrom (where required).

(e) Test report of the combined assembled unit, including a definite report on the suitability of the driving unit (and controller, if furnished) for its specific application and harmony of assembly of all independent units going to make up the complete equipment.

Distribution of complete test reports on the combined assembled units shall be as follows, except when applicable material specification requires that test data be indicated on and made a part of the plans for the equipment.

(a) Two to Bureau of Ships.

(b) One to each vessel concerned (to be forwarded via Supervisor of Shipbuilding or commandant of the building yard).

(c) Two to each Supervisor of Shipbuilding (one for the Supervisor's files, the other for the shipbuilder), for privately built ships.

(d) One to commandant for each building yard concerned, for navy yard built vessels.

(e) One for primary district inspection office.

(f) One for branch inspection office (if any).

METHOD OF FOLDING BLUEPRINTS

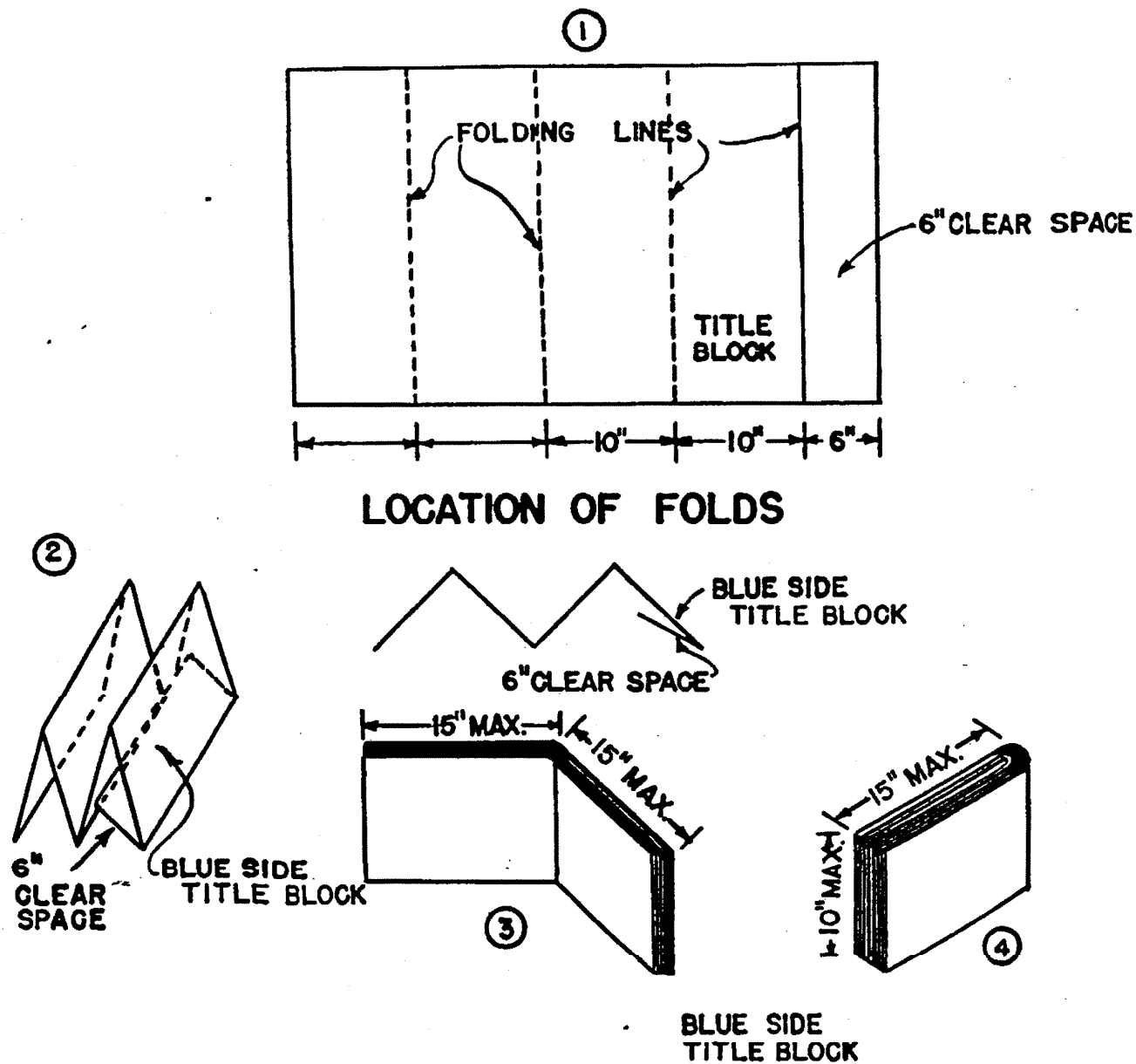


FIGURE 1.

THIS SPACE
TO BE KEPT CLEAR

LENGTH OF PLAN OPTIONAL

FOR ALL PLANS EXCEPT WHERE INCREASED WIDTH IS
NECESSARY TO SUIT SCALE SPECIFIED BY THE BUREAU
AND IN OTHER EXCEPTIONAL CIRCUMSTANCES WHERE
SPECIFICALLY APPROVED BY THE PLAN APPROVAL
ACTIVITY

THE DATA IN THESE BLOCKS ARE
NOT REQUIRED FOR MASTER PLANS

THIS COLUMN FOR
OFFICIAL NUMBERS OF
APPLICABLE VESSELS.
VESSELS TO BE LISTED
CONSECUTIVELY AND
CONSECUTIVE VESSELS
BY ONE SHIPBUILDER
TO BE GROUPED TO-
GETHER

THIS COLUMN FOR
NAME OF BUILDING
YARDS AND, IF DES-
IRED, HULL NUMBERS

APPLICABLE VESSELS' LIST
TO BEGIN HERE FOR SHIPS' PLANS

WHEN FINAL TRACING IS COMPLETED, THIS BLOCK
IS TO BE STAMPED "CORRECTED PLAN" OR "HULL
FINISHED PLAN," THE TERMS APPLYING TO SHIP
PLANS AS DISTINGUISHED FROM MASTER PLANS

THIS BLOCK RESERVED FOR APPROVAL OR VALID-
ATION BY AVAL ACTIVITIES OTHER THAN THE
ACTIVITY ORIGINALLY APPROVING THE PLAN

IN THOSE CASES WHERE PLAN IS APPROVED
BY THE BUREAU, ENTER THE BUREAU OF SHIPS
FILE NUMBER AND DATE OF LETTER APPROV-
ING PLAN

APPROVED BY _____
SIGNED _____ DATE _____
TITLE _____

USE OF THIS SPACE
IS OPTIONAL

NAME, ADDRESS AND PLAN NUMBER
OF SUB-CONTRACTOR

NAME, ADDRESS AND
PLAN NUMBER OF
SHIPBUILDER OR CONTRACTOR

ARRANGEMENT MAY BE
MODIFIED AS DESIRED
BY CONTRACTOR

SCALE _____ DRAWN BY _____ DATE _____
TRACED BY _____ CHECKED BY _____ CHIEF DRAFTSMAN _____
APPROVED BY _____

THIS SPACE MAY BE USED FOR RECORD OF
PRINTS OR OTHER DATA FOUND DESIRABLE FOR
THE CONTRACTOR'S PRIVATE USE

THIS SPACE SHOULD NOT BE USED FOR BU-
REAU ALTERATION TABLES, BILLS OF MATER-
IAL OR ANY OTHER DATA NECESSARY FOR
THE COMPLETE UNDERSTANDING OF THE PLAN

TITLE

THE WORDS "MASTER PLAN" TO BE ENTERED AT
THE TOP OF THIS BLOCK FOR PLANS APPROV-
ED AS MASTER PLANS

BUREAU OF SHIPS PLAN NUMBER

ALT.

STANDARD TITLE BLOCK
FOR MASTER PLANS
AND SHIPS PLANS

SCALE 12" = 1'-0"
NAVY DEPARTMENT
BUREAU OF SHIPS

WASHINGTON, D.C.

30 October 1944

BUSHIPS NO. S 0103-655774

J. E. Harkins
FOR CHIEF OF BUREAU